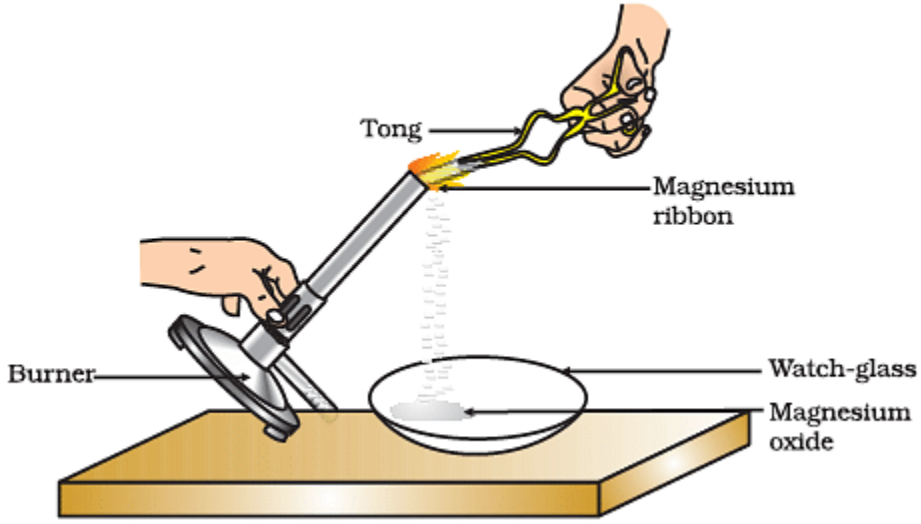
NEW
LEARNER'S
EDGE

Chemical Reactions and Equations

Q1: Answer the following questions based on the diagram given below:



(i) What is the purpose of burning a magnesium ribbon in air in this experiment?
Ans: The purpose of burning a magnesium ribbon in air is to observe the reaction of magnesium with oxygen and to collect the product, which is magnesium oxide.

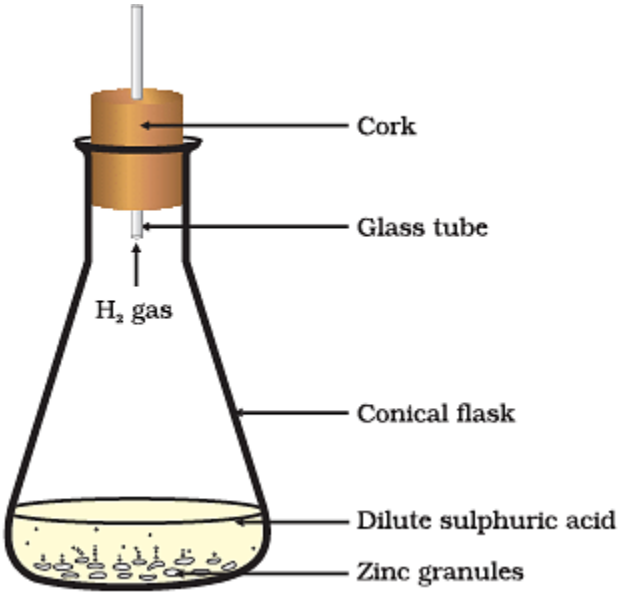
(ii) Describe the appearance of the magnesium ribbon before it is burnt.
Ans: Before burning, the magnesium ribbon appears as a shiny, silver-colored metal strip.

(iii) What happens to the magnesium ribbon when it is burnt in air?
Ans: When the magnesium ribbon is burnt in air, it reacts with oxygen to form magnesium oxide. During this reaction, the magnesium ribbon glows brightly and produces a white powder (magnesium oxide).

(iv) How is magnesium oxide collected in this experiment?
Ans: Magnesium oxide is collected in a watch-glass. It is the white powder that forms on the surface of the watch-glass as a result of the reaction between magnesium and oxygen.

(v) Write the balanced chemical equation for the reaction that takes place when magnesium burns in air.
Ans: The balanced chemical equation for the reaction is:
$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

Q2: Answer the following questions based on the diagram given below:



(i) What is the chemical reaction that occurs when dilute sulfuric acid reacts with zinc?
Ans: The chemical reaction between dilute sulfuric acid and zinc is represented as:
$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\uparrow$
In this reaction, zinc displaces hydrogen from sulfuric acid, forming zinc sulfate and hydrogen gas.

(ii) How can we test the presence of hydrogen gas during this experiment?
Ans: To test the presence of hydrogen gas, you can bring a burning splint near the mouth of the test tube where the reaction is happening. If you hear a "pop" sound and see a flame, it indicates the presence of hydrogen gas.

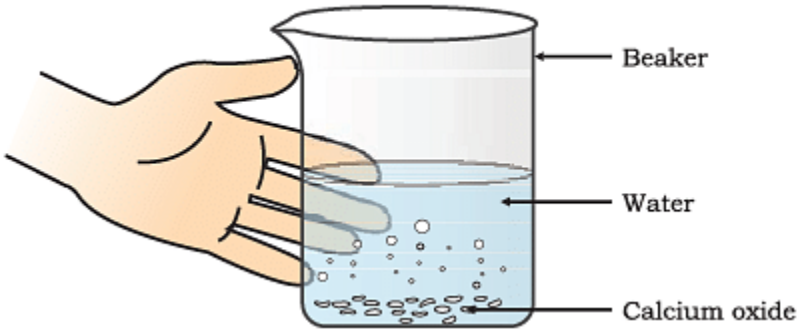
(iii) What is the role of zinc in this reaction?
Ans: Zinc acts as a reducing agent in this reaction. It donates electrons to hydrogen ions in sulfuric acid, leading to the production of hydrogen gas.

(iv) Why do we use dilute sulfuric acid in this experiment instead of concentrated sulfuric acid?
Ans: We use dilute sulfuric acid because it is safer and less reactive than concentrated

sulfuric acid. Concentrated sulfuric acid is highly corrosive and can produce a vigorous reaction with zinc, making it

(v) What is the significance of the "↑" symbol in the chemical equation for this reaction?
Ans: The "↑" symbol indicates that hydrogen gas is produced as a gas and is released into the air during the reaction. It helps us understand that hydrogen gas is one of the products of the reaction and is liberated in the form of bubbles.

Q3: Answer the following questions based on the diagram given below:



(i) What are the reactants in the experiment for the formation of slaked lime?
Ans: The reactants in this experiment are calcium oxide (CaO) and water (H_2O).

(ii) Describe the appearance of calcium oxide (CaO) before the reaction with water.
Ans: Calcium oxide appears as a white, powdery substance before the reaction with water.

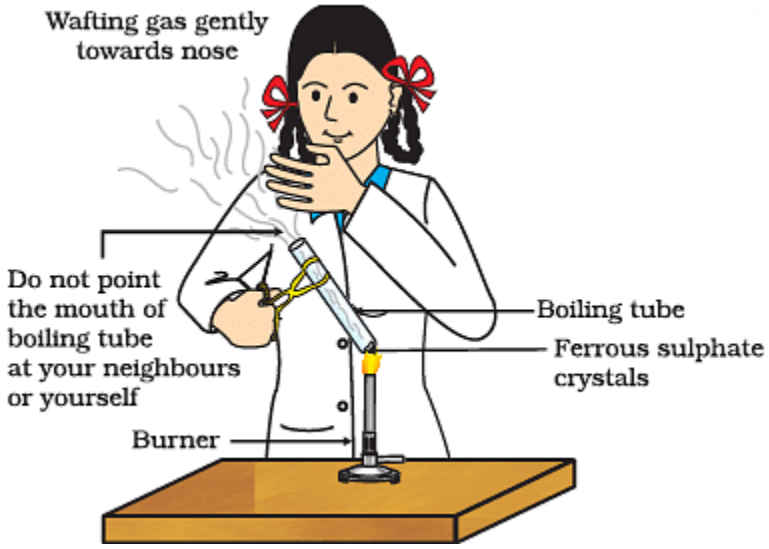
(iii) What is the chemical formula of the product formed in this experiment, and what is its common name?
Ans: The chemical formula of the product formed is calcium hydroxide ($Ca(OH)_2$), and its common name is slaked lime.

(iv) Explain how the appearance of the mixture changes during the reaction between calcium oxide and water.
Ans: During the reaction, the mixture changes from a white, powdery substance (calcium oxide) to a thick, white, and pasty substance (slaked lime or calcium hydroxide).

(v) Why is the formation of slaked lime considered a combination reaction?
Ans: The formation of slaked lime is considered a combination reaction because it involves the combination of two substances, calcium oxide and water, to form a single

product, calcium hydroxide, without the release of any additional substances.

Q4: Answer the following questions based on the diagram given below:


Wafting gas gently towards nose
Do not point the mouth of boiling tube at your neighbours or yourself
Boiling tube
Ferrous sulphate crystals
Burner

(i) What is the purpose of heating the boiling tube containing crystals of ferrous sulfate in this experiment?
Ans: To observe the effect of heating on the crystals of ferrous sulfate.

(ii) What is the appearance of ferrous sulfate crystals before heating, and how does it change after heating?
Ans: Before heating, the ferrous sulfate crystals are usually green in color. After heating, they turn white and lose their water of crystallization.

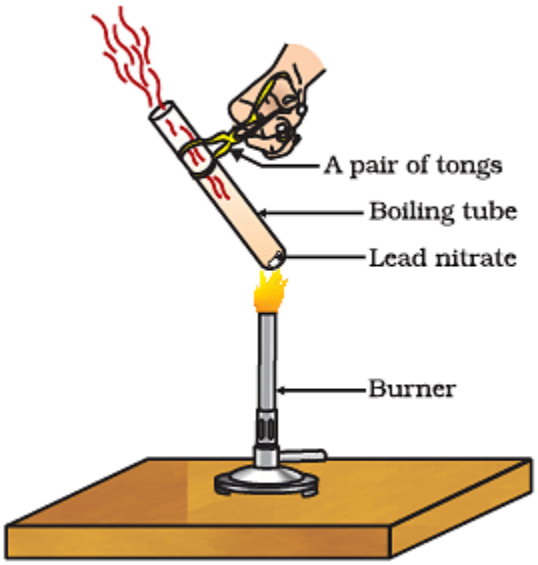
(iii) Why is it important to observe the odor during this experiment?
Ans: Odor observation helps identify the presence of sulfur dioxide gas, which is released when ferrous sulfate is heated.

(iv) Describe the odor you would expect when heating ferrous sulfate crystals, and explain the chemical reaction responsible for it.
Ans: The odor would be of burning sulfur or a pungent, rotten egg smell. This is due to the decomposition of ferrous sulfate, which releases sulfur dioxide gas (SO_2) when heated.

(v) How would you test the presence of sulfur dioxide gas in this experiment?
Ans: You can pass the gas produced during heating through a glass tube into a solution

of sodium hydroxide (NaOH). If sulfur dioxide gas is present, it will react with NaOH to form sodium sulfite (Na_2SO_3), which can be detected by the formation of a white precipitate.

Q5: Answer the following questions based on the diagram given below:



(i) What is the initial substance in the experiment shown in Figure?
Ans: The initial substance in the experiment is lead nitrate (Pb(NO3)2).

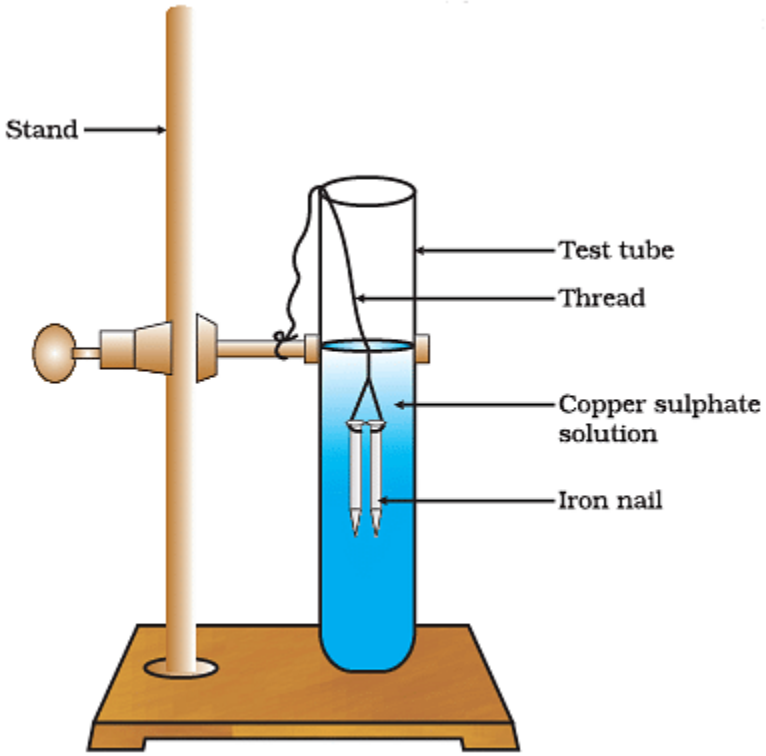
(ii) What is the evidence that a chemical reaction has occurred during heating?
Ans: The evidence of a chemical reaction is the emission of brown fumes, which are identified as nitrogen dioxide (NO_2). This indicates that a chemical change has taken place.

(iii) Write the chemical equation for the thermal decomposition of lead nitrate.
Ans: The chemical equation for the thermal decomposition of lead nitrate is: $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2(g) + O_2(g)$. This equation represents the conversion of lead nitrate into lead oxide, nitrogen dioxide, and oxygen.

(iv) What is the role of heat in this experiment?
Ans: Heat is used as an energy source to break the chemical bonds in lead nitrate ($Pb(NO_3)_2$). This process, known as thermal decomposition, results in the formation of lead oxide (PbO), nitrogen dioxide (NO_2), and oxygen (O_2).

(v) Why is it important to use tongs while heating the boiling tube?
Ans: Tongs are used to hold the boiling tube because the experiment involves high temperatures, and it can become very hot. Using tongs ensures the safety of the experimenter by preventing direct contact with the hot glass, which could cause burns or injuries.

Q6: Answer the following questions based on the diagram given below:



(i) Describe the setup of the experiment where iron nails are dipped in copper sulfate solution.
Ans: In the experiment, take a beaker and fill it with copper sulfate solution. Place some iron nails in the solution and observe the changes over time. Ensure that the nails are fully immersed in the solution.

(ii) What is the initial color of the copper sulfate solution, and what happens to it as the experiment proceeds?
Ans: Initially, the copper sulfate solution is blue in color. As the experiment proceeds, the blue color of the solution starts to fade, and the solution turns greenish due to the formation of a new compound.

(iii) Explain the chemical reaction that occurs when iron nails are dipped in copper sulfate solution.

Ans: When iron nails are dipped in copper sulfate solution, a displacement reaction occurs. The iron in the nails reacts with copper sulfate to form iron sulfate and copper metal. The chemical equation for this reaction is:

Iron (Fe) + Copper Sulfate ($CuSO_4$) $\rightarrow$ Iron Sulfate ($FeSO_4$) + Copper (Cu)

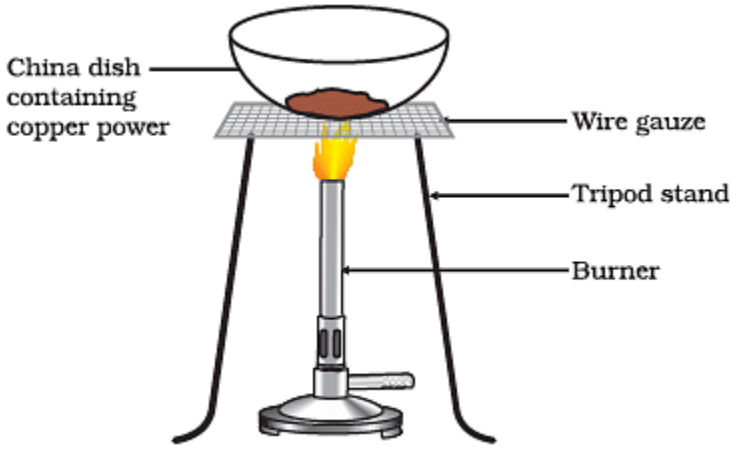
(iv) What is the solid substance that forms on the surface of the iron nails during the experiment?

Ans: A reddish-brown solid substance, which is copper, forms on the surface of the iron nails during the experiment. This is a visible result of the displacement reaction taking place.

(v) How can you confirm the presence of copper in the final solution after the experiment?

Ans: To confirm the presence of copper in the final solution, you can perform a simple test. Add a few drops of dilute hydrochloric acid (HCl) to the greenish solution. If copper is present, a brown gas (hydrogen gas) will be evolved, and you may also notice the solution turning blue again due to the formation of copper chloride. This confirms the presence of copper in the solution.

Q7: Answer the following questions based on the diagram given below:



(i) What is the initial color of the copper wire before the oxidation experiment?

Ans: The initial color of the copper wire is reddish-brown.

(ii) Describe the changes in the color of the copper wire after it undergoes oxidation.
Ans: After oxidation, the copper wire turns black due to the formation of copper oxide.

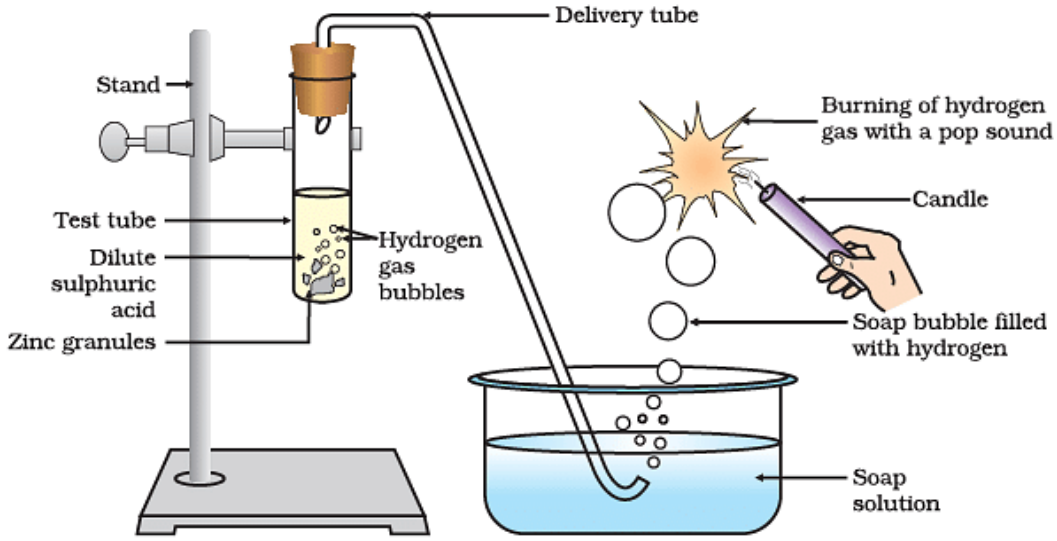
(iii) Explain the role of heat in the oxidation of copper.
Ans: Heat is necessary for the oxidation of copper. It provides the energy required for copper atoms to react with oxygen in the air and form copper oxide.

(iv) What type of chemical reaction is observed during the oxidation of copper?
Ans: The oxidation of copper is a chemical reaction called a redox reaction, where copper atoms lose electrons and combine with oxygen to form copper oxide.

(v) Why is the copper wire cleaned before the experiment?
Ans: The copper wire is cleaned before the experiment to remove any impurities, such as grease or dirt, that might hinder the oxidation process and to ensure accurate observations during the experiment.

Acids, Bases and Salts

Q1: Answer the following questions based on the diagram given below:



(i) What are the reactants in the experiment, and what does it produce?
Ans: In the experiment, zinc granules are the reactant, and when they react with dilute sulfuric acid, they produce zinc sulfate and hydrogen gas.

(ii) Describe how hydrogen gas is collected during the experiment.
Ans: Hydrogen gas is collected by the downward displacement of water method. A test tube filled with water is inverted over the zinc granules in the beaker containing dilute sulfuric acid. As the reaction proceeds, hydrogen gas displaces the water in the test tube, and it collects in the test tube.

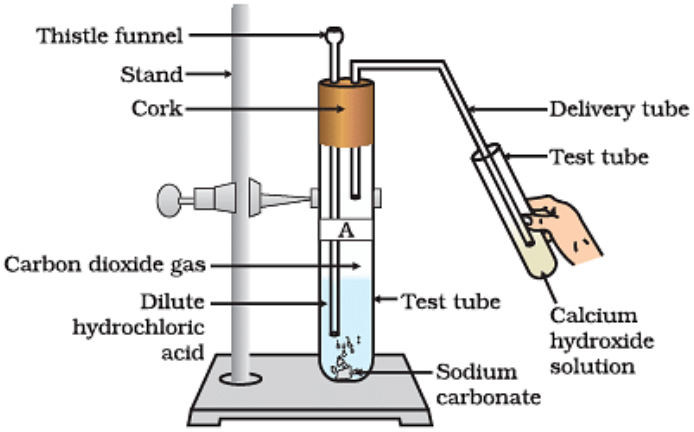
(iii) What happens when a burning splint is brought near the mouth of the test tube containing collected hydrogen gas?
Ans: When a burning splint is brought near the mouth of the test tube containing collected hydrogen gas, you will hear a pop sound. This pop sound indicates the presence of hydrogen gas, which is highly flammable and combustible.

(iv) Explain the chemical equation for the reaction between zinc and dilute sulfuric acid.
Ans: The chemical equation for the reaction is:
Zinc (Zn) + Dilute Sulfuric Acid (H_2SO_4) $\rightarrow$ Zinc Sulfate ($ZnSO_4$) + Hydrogen Gas (H_2)

(v) Why is it important to perform this experiment in a well-ventilated area or under a fume hood?

Ans: It is important to perform this experiment in a well-ventilated area or under a fume hood because the evolution of hydrogen gas can displace the air, leading to the accumulation of hydrogen, which is flammable. Adequate ventilation helps to disperse any potentially dangerous gas buildup and ensures safety in the laboratory.

Q2: Answer the following questions based on the diagram given below:



(i) What happens when carbon dioxide gas is passed through calcium hydroxide solution?

Ans: When carbon dioxide gas is passed through calcium hydroxide solution, it forms a white precipitate of calcium carbonate, which makes the solution turn milky.

(ii) What is the chemical equation for the reaction between carbon dioxide and calcium hydroxide solution?

Ans: The chemical equation for this reaction is:

$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$

(iii) What is the common name for calcium carbonate?

Ans: Calcium carbonate is commonly known as limestone, chalk, or marble, depending on its form.

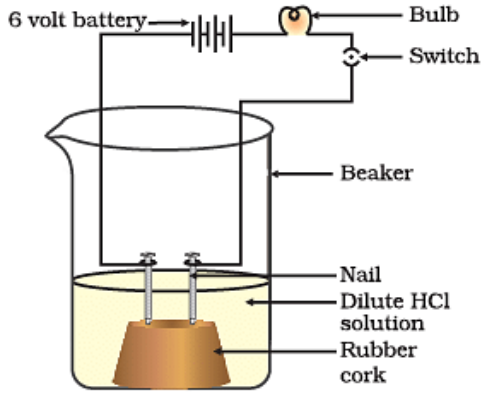
(iv) Why does the milky appearance of calcium hydroxide solution disappear when excess carbon dioxide is passed through it?

Ans: The milky appearance disappears when excess carbon dioxide is passed because

calcium carbonate formed initially is slightly soluble in water. It dissolves in the excess carbon dioxide to form calcium bicarbonate, which is soluble.

(v) What type of reaction is represented by the reaction between calcium hydroxide solution and carbon dioxide?
Ans: The reaction between calcium hydroxide solution and carbon dioxide is a neutralization reaction, where a base (calcium hydroxide) reacts with an acid (carbon dioxide) to form a salt (calcium carbonate) and water.

Q3: Answer the following questions based on the diagram given below:



(i) What is the purpose of the experiment shown in the diagram?
Ans: The purpose of this experiment is to demonstrate that an acid solution in water can conduct electricity.

(ii) In the experiment, what is represented by the two beakers filled with solutions?
Ans: The two beakers represent containers filled with different solutions. One contains an acid solution in water, and the other contains distilled water.

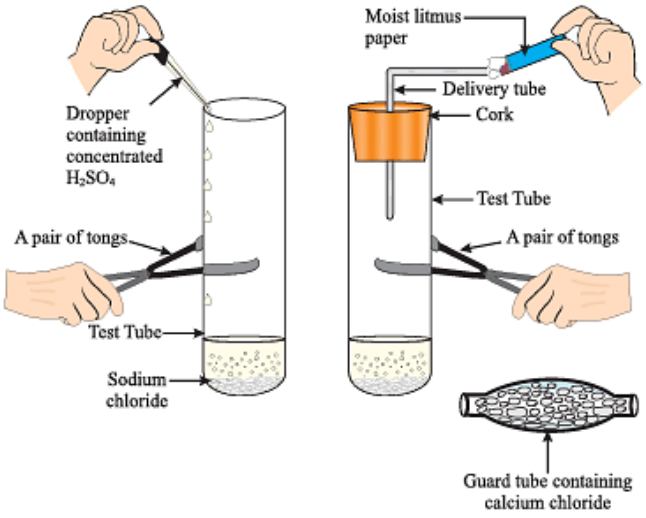
(iii) Explain why the bulb in the circuit glows when the wires are connected to the beaker containing the acid solution.
Ans: The bulb in the circuit glows when connected to the beaker with the acid solution because the acid solution allows the flow of electric current. This indicates that acids are conductors of electricity.

(iv) What happens when the wires are connected to the beaker containing only distilled water?
Ans: When the wires are connected to the beaker containing only distilled water, the

bulb in the circuit does not glow. This shows that distilled water does not conduct electricity.

(v) How can you relate this experiment to real-life situations where understanding the conductivity of liquids is important?
Ans: This experiment helps us understand the conductivity of liquids, which is crucial in various real-life situations such as testing the purity of water, understanding the behavior of different substances in electrical circuits, and in the functioning of batteries and electrochemical cells. It has practical applications in science and industry.

Q4: Answer the following questions based on the diagram given below:



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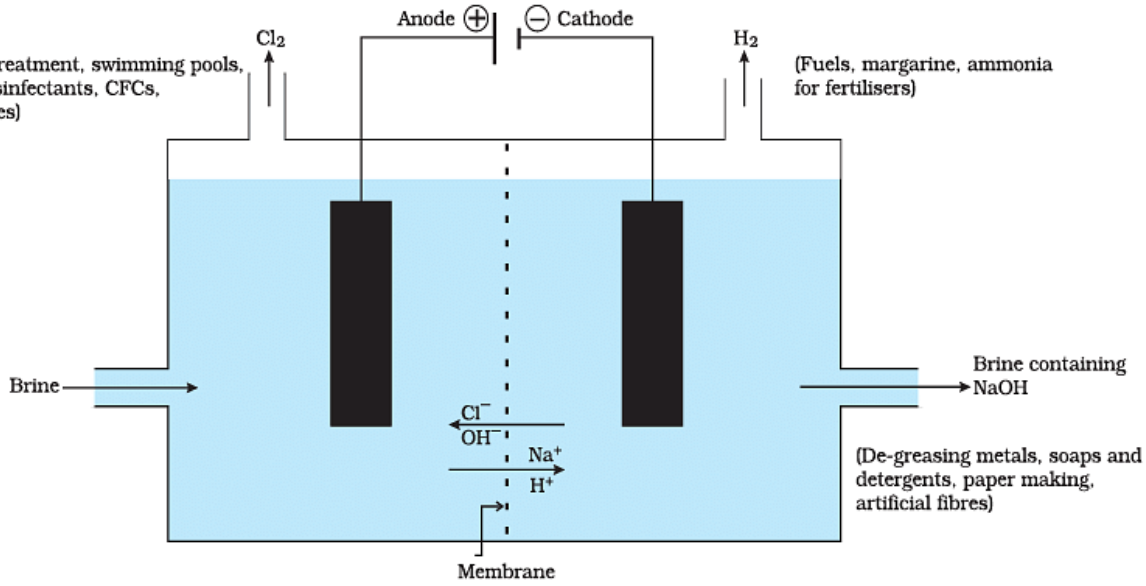
Q5: Answer the following questions based on the diagram given below:



(i) What are the main products of the chlor-alkali process?
Ans: The main products of the chlor-alkali process are chlorine gas (Cl_2), sodium hydroxide (NaOH), and hydrogen gas (H_2).

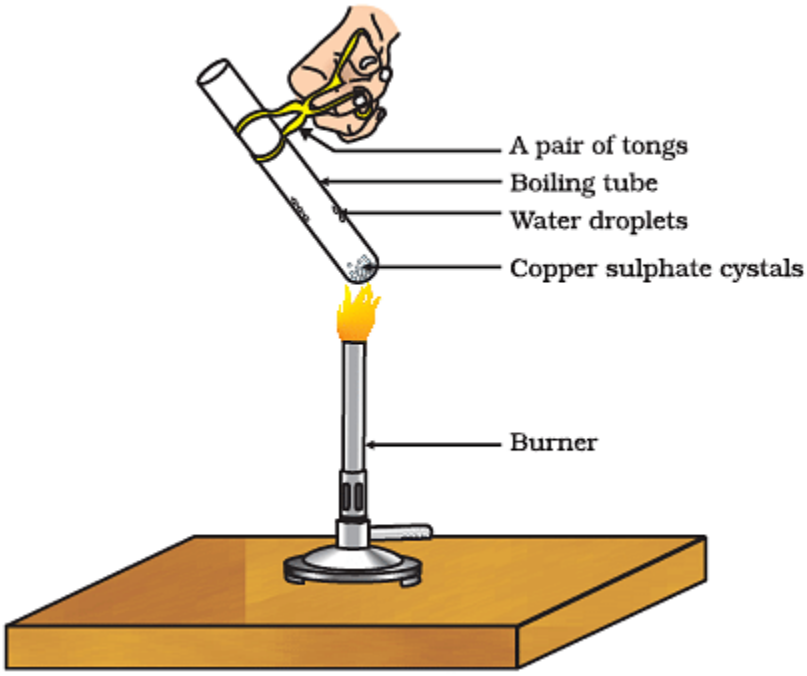
(ii) How is chlorine gas produced in the chlor-alkali process?
Ans: Chlorine gas is produced at the anode during the electrolysis of brine (sodium chloride solution) in the chlor-alkali process.

(iii) What is the chemical equation for the production of sodium hydroxide in the chlor-alkali process?
Ans: The chemical equation for the production of sodium hydroxide is $2NaOH + Cl_2 \rightarrow NaCl + NaClO + H_2O$.

(iv) Why is the chlor-alkali process important in industry?
Ans: The chlor-alkali process is important in industry because it produces key chemicals like chlorine, sodium hydroxide, and hydrogen, which are used in various industrial processes, including water purification, manufacturing of soaps and detergents, and the production of plastics.

(v) What is the environmental impact of the chlor-alkali process, and how can it be mitigated?
Ans: The chlor-alkali process can generate chlorine gas, which is harmful to the environment. To mitigate its impact, modern industrial processes often use membrane cell technology that reduces the release of chlorine gas into the atmosphere, making the process more environmentally friendly.

Q6: Answer the following questions based on the diagram given below:



(i) What is water of crystallization?
Ans: Water of crystallization is a fixed number of water molecules that are chemically bound to the ions or molecules in a crystalline structure of a salt.

(ii) How can you visually tell if copper sulfate crystals contain water of crystallization?
Ans: You can tell if copper sulfate crystals contain water of crystallization by their blue color. Dry crystals are blue, indicating the presence of water molecules within the crystal lattice.

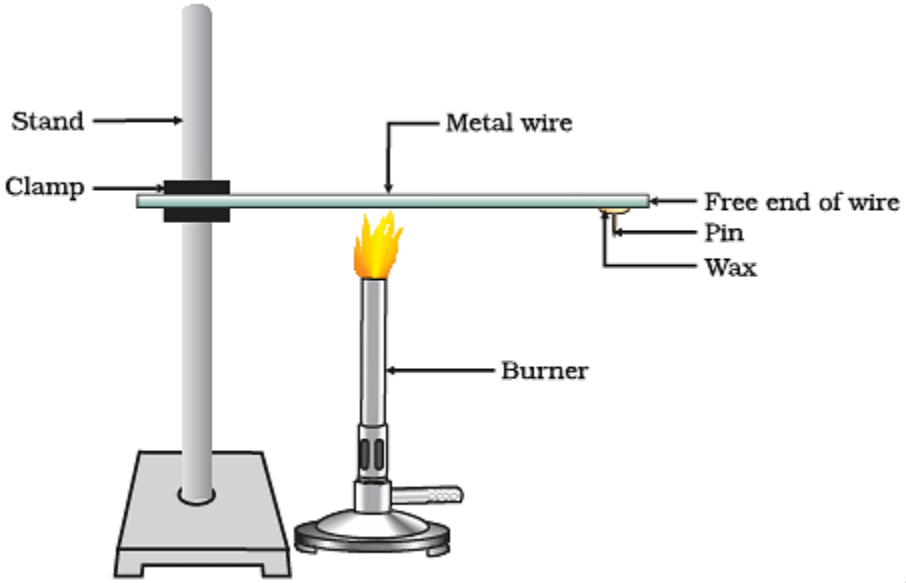
(iii) What happens to copper sulfate crystals when they are heated?
Ans: When copper sulfate crystals are heated, they lose their water of crystallization, and the salt turns from blue to white.

(iv) What is the chemical formula for hydrated copper sulfate?
Ans: The chemical formula for hydrated copper sulfate is $CuSO_4 \cdot 5H_2O$, which means there are five water molecules for every formula unit of copper sulfate.

(v) Can you name another salt that has water of crystallization, and what is its chemical formula?
Ans: Yes, another salt with water of crystallization is gypsum. Its chemical formula is $CaSO_4 \cdot 2H_2O$, which means it contains two water molecules for every formula unit of gypsum.

Metals and Non-metals

Q1: Answer the following questions based on the diagram given below:



(i) What is the purpose of clamping the metal wire on a stand in the experiment?
Ans: The wire is clamped on a stand to hold it in place while heating and to ensure that it doesn't move during the experiment.

(ii) What is the role of the pin fixed to the free end of the wire using wax?
Ans: The pin allows us to observe any changes in the wire's behavior as it is heated, specifically to see if it melts or undergoes any other noticeable changes.

(iii) Which metals are mentioned as the best conductors of heat in the text?
Ans: The best conductors of heat mentioned in the text are silver and copper.

(iv) What does the experiment demonstrate about the conductivity of heat in metals?
Ans: The experiment demonstrates that metals are good conductors of heat because the metal wire heats up when exposed to a heat source.

(v) Which metals are comparatively poor conductors of heat?
Ans: Lead and mercury are mentioned as comparatively poor conductors of heat in the text.

Q2: Answer the following questions based on the diagram given below:

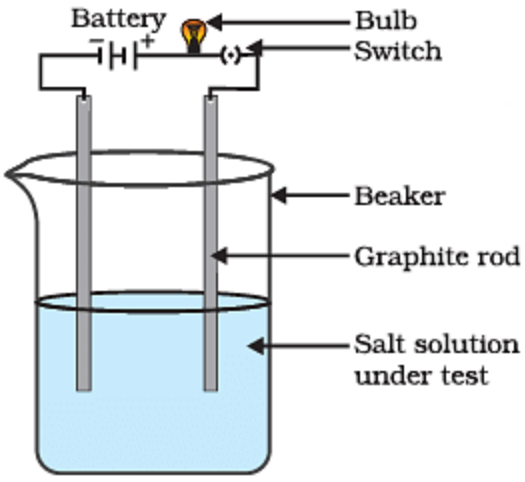


Figure 3.8
Testing the conductivity of a salt solution

(i) What is the purpose of the experiment depicted in the diagram?
Ans: The purpose of the experiment is to test the conductivity of a salt solution.

(ii) Describe the setup shown in the diagram used to test the conductivity of the salt solution.
Ans: The setup includes a battery or power source, wires, two electrodes (usually made of metal), and a container with the salt solution. The electrodes are connected to the battery, forming a closed circuit through the solution.

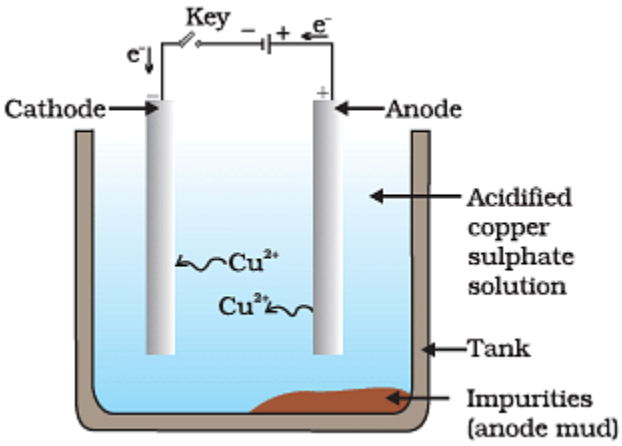
(iii) Explain why the bulb in the circuit lights up when the salt solution is added.
Ans: The bulb lights up because the salt solution allows the flow of electric current. This happens because salt (an ionic compound) dissociates into ions in the solution, allowing the flow of charged particles (ions) between the electrodes, completing the electrical circuit and lighting up the bulb.

(iv) What would happen if you replaced the salt solution with distilled water in this experiment?
Ans: If distilled water is used instead of a salt solution, the bulb would not light up. Distilled water does not contain ions in significant quantities, so it does not conduct electricity as effectively as a salt solution.

(v) What is the significance of this experiment in real-life applications?
Ans: This experiment helps us understand the concept of electrical conductivity and is

important in various real-life applications. For example, it is used in testing the purity of water, determining the strength of electrolyte solutions in batteries, and in various industries where the conductivity of solutions is crucial for processes such as metal plating and chemical manufacturing.

Q3: Answer the following questions based on the diagram given below:



(i) What is the purpose of the experiment shown in the image?
Ans: The purpose of this experiment is to purify impure copper using the process of electrolytic refining.

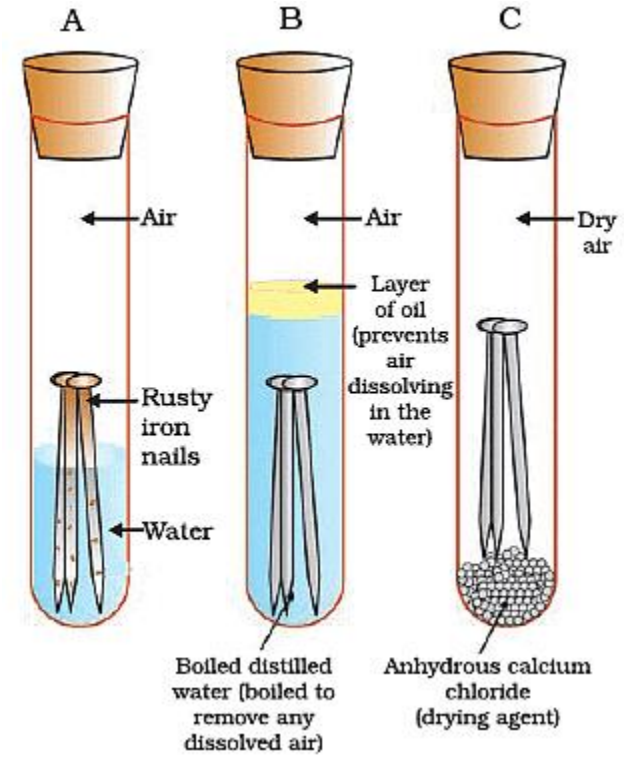
(ii) What is the role of the anode in this experiment?
Ans: The anode is made of impure copper and it serves as the source of copper ions during the electrolysis process.

(iii) Why is the cathode made of pure copper?
Ans: The cathode is made of pure copper to allow the deposition of pure copper ions from the electrolyte onto the cathode, thus purifying the copper.

(iv) What is the composition of the electrolyte used in this experiment?
Ans: The electrolyte used in this experiment is a solution of acidified copper sulfate.

(v) What happens when electric current is passed through the setup shown in the image?
Ans: When electric current is passed through the setup, copper ions from the impure anode dissolve into the electrolyte, move towards the cathode, and get deposited as pure copper on the cathode, leaving impurities behind in the anode.

Q4: Answer the following questions based on the diagram given below:



(i) What is the purpose of this experiment?
Ans: The purpose of this experiment is to study the conditions under which iron rusts and observe how the presence or absence of air and water affects the rusting of iron.

(ii) What are the three different tubes labeled in the experiment, and what do they represent?
Ans: The three tubes are labeled A, B, and C. Tube A represents the condition where both air and water are present, Tube B represents the condition with no air dissolved in the water, and Tube C represents the condition where the air is dry.

(iii) Why is it essential to have water present in Tube A for this experiment?
Ans: Water is essential in Tube A because rusting of iron typically involves the reaction of iron with oxygen and water vapor from the air. So, to study rusting, both air and water are required.

(iv) What is the role of Tube B in this experiment, and how does it differ from Tube A?
Ans: Tube B helps us understand the role of air in the rusting process. It differs from

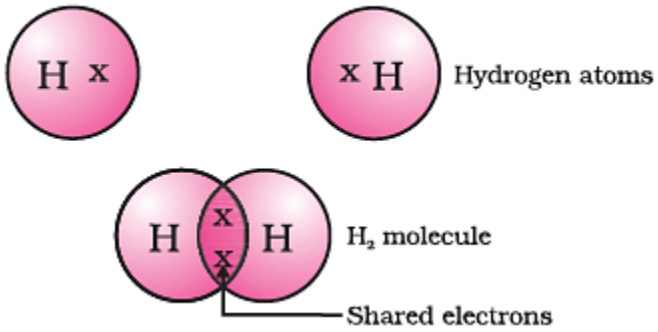
Tube A as it has water but no dissolved air, which allows us to observe if the presence of air is necessary for rusting.

(v) What is the significance of Tube C in the experiment, and what does it tell us about the rusting process?

Ans: Tube C is important as it contains dry air. It helps us determine whether moisture (water vapor) in the air is necessary for iron to rust. If rusting occurs in Tube C, it suggests that moisture in the air is not required for rusting.

Carbon and its compounds

Q1: Answer the following questions based on the diagram given below:



(ii) What is the chemical formula of methane?
Ans: The chemical formula of methane is CH_4.

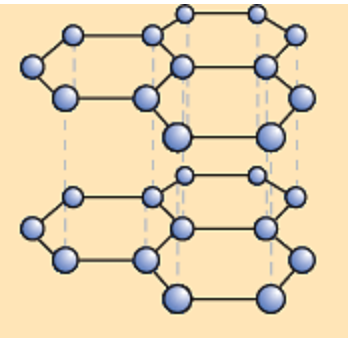
(ii) How many valence electrons does carbon have in methane?
Ans: Carbon has four valence electrons in methane.

(iii) How many hydrogen atoms are bonded with carbon in methane?
Ans: In methane, carbon is bonded to four hydrogen atoms.

(iv) What type of bonds are formed between carbon and hydrogen in methane?
Ans: Covalent bonds are formed between carbon and hydrogen in methane.

(v) Why are covalent compounds like methane generally poor conductors of electricity?
Ans: Covalent compounds like methane are poor conductors of electricity because they have shared electrons between atoms, and no charged particles (ions) are formed within them, limiting their ability to conduct electrical current.

Q2: Answer the following questions based on the diagram given below:



(i) What is the basic structure of graphite?
Ans: Graphite is made up of hexagonal arrays of carbon atoms in layers. Each carbon atom is bonded to three other carbon atoms within the same plane, and one of these bonds is a double bond.

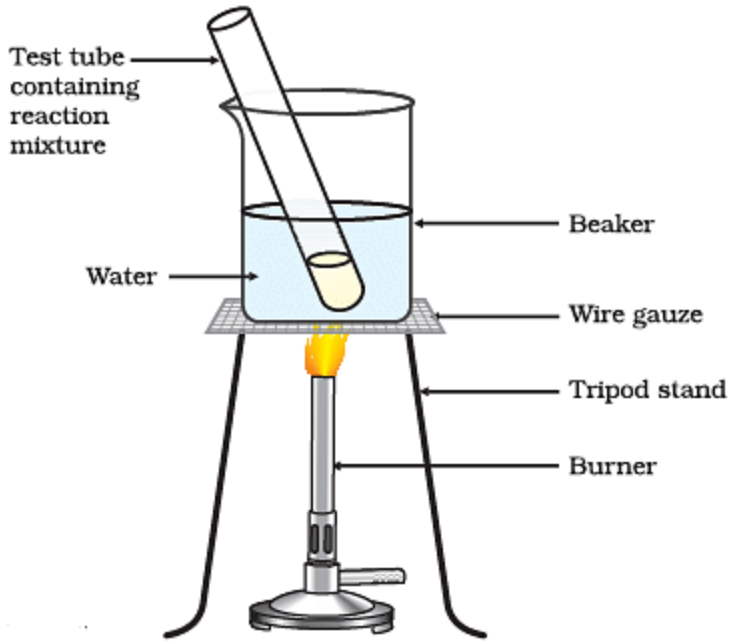
(ii) How are the layers of carbon atoms arranged in graphite?
Ans: The layers of carbon atoms in graphite are placed one above the other, creating a stacked structure.

(iii) Why do diamond and graphite have different physical properties despite having the same chemical properties?
Ans: Diamond and graphite have different physical properties because of their distinct structures. Diamond's three-dimensional, tightly packed structure makes it the hardest substance, while graphite's layered structure allows it to be smooth, slippery, and a good conductor of electricity.

(iv) What is the significance of the double bonds between carbon atoms in graphite?
Ans: The double bonds between carbon atoms in graphite satisfy the valency of carbon and provide stability to the structure.

(v) How does the arrangement of carbon atoms in graphite contribute to its excellent electrical conductivity?
Ans: The hexagonal arrangement of carbon atoms in graphite allows for the presence of free electrons between the layers. These free electrons can move easily, making graphite an excellent conductor of electricity.

Q3: Answer the following questions based on the diagram given below:



(i) What is the process shown in the diagram titled "Formation of Ester"?
Ans: The process shown in the diagram is the formation of an ester, which is a chemical reaction between an alcohol and a carboxylic acid to produce an ester and water.

(ii) What are the two main reactants involved in the formation of an ester?
Ans: The two main reactants involved in the formation of an ester are an alcohol and a carboxylic acid.

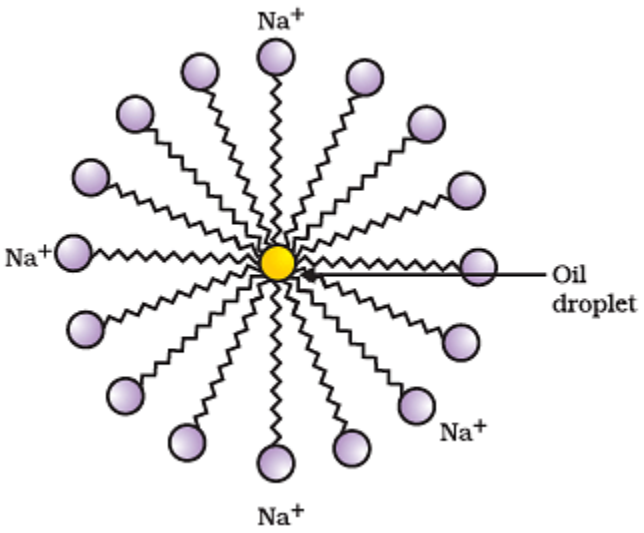
(iii) What type of bond is formed during the formation of an ester, and what is the byproduct of this reaction?
Ans: A covalent bond called an ester bond is formed during the reaction, and the byproduct is water (H_2O).

(iv) What are some examples of esters that are commonly found in nature or used in everyday life?
Ans: Examples of esters found in nature include the esters responsible for the scent of flowers and fruits. Esters are also used in artificial flavorings and fragrances, such as isoamyl acetate (banana flavor) and ethyl acetate (nail polish remover).

(v) How does the formation of esters contribute to the world of perfumes and flavors?
Ans: The formation of esters is essential in the production of perfumes and flavors. By carefully selecting different alcohol and carboxylic acid combinations, chemists can

create a wide variety of pleasant scents and flavors that mimic those found in nature, enhancing our experiences with perfumes and food.

Q4: Answer the following questions based on the diagram given below:



(i) What is the main reason behind using soap for cleaning?
Ans: The main reason for using soap for cleaning is that soap molecules can form structures called micelles, which help in removing dirt and oil from surfaces, making it easier to wash them away with water.

(ii) How do soap molecules interact with both water and oil?
Ans: Soap molecules have one end that is attracted to water (hydrophilic) and another end that is attracted to oil (hydrophobic). This allows soap to interact with both water and oil simultaneously.

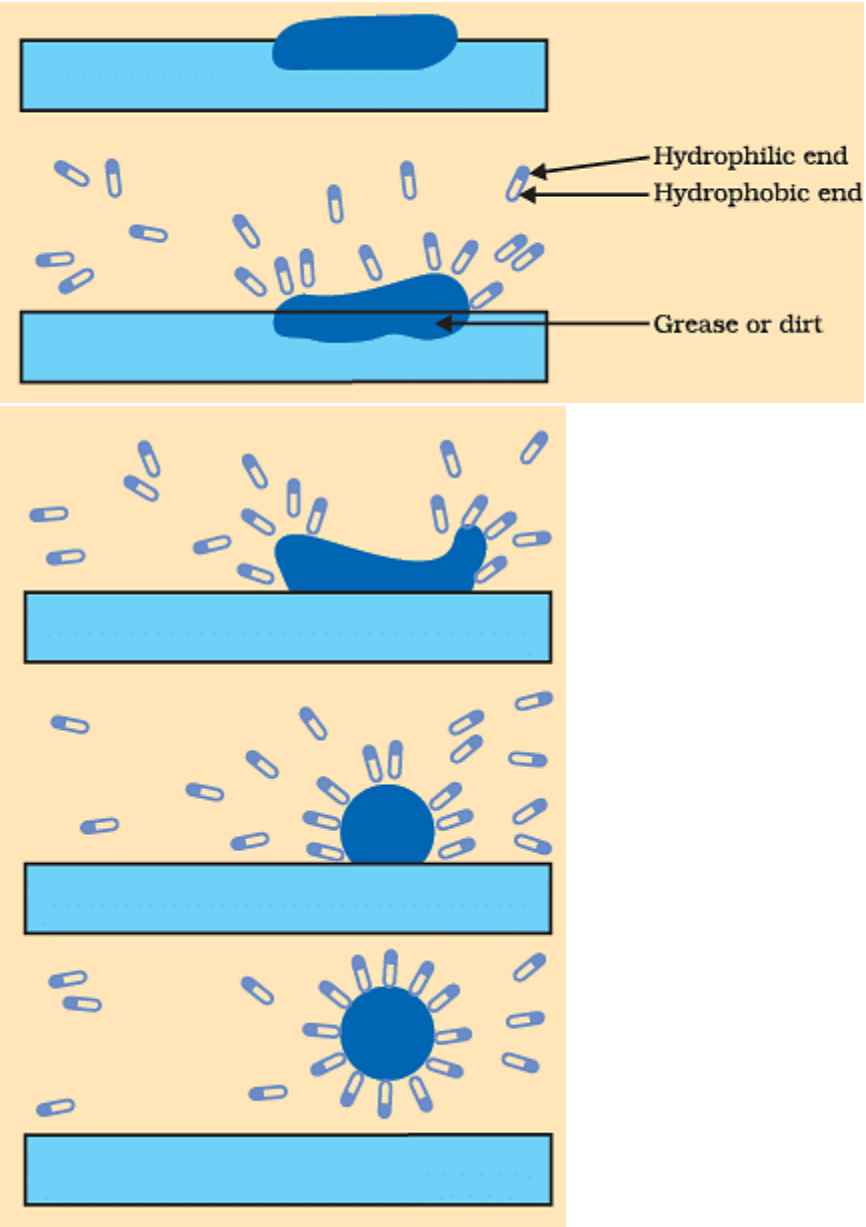
(iii) What is a micelle, and how does it form?
Ans: A micelle is a structure formed by soap molecules in water. In a micelle, the hydrophilic (water-attracting) ends of soap molecules face outward, while the hydrophobic (oil-attracting) ends cluster together inside, surrounding and trapping oil and dirt particles.

(iv) Why doesn't oil dissolve in water, and how do micelles help in cleaning oily substances?
Ans: Oil doesn't dissolve in water because oil is hydrophobic and repels water. Micelles help in cleaning oily substances by encapsulating the oil droplets within their

hydrophobic cores, allowing them to be carried away in water, effectively removing the oil.

(v) How does soap make it easier to wash clothes clean?
Ans: Soap makes it easier to wash clothes clean by forming micelles that surround and lift away oily and dirty particles from the fabric. These micelles keep the dirt suspended in water, allowing it to be rinsed away when we wash our clothes, resulting in cleaner and fresher laundry.

Q5: Answer the following questions based on the diagram given below:



(i) What happens to soap molecules when they are at the surface of water?
Ans: When soap molecules are at the surface of water, their hydrophobic tails protrude out of the water, while the ionic ends interact with the water, causing the soap molecules to align along the water's surface.

(ii) How do soap molecules organize themselves when they are in water?
Ans: Inside water, soap molecules form structures called micelles. In a micelle, the hydrophobic tails are on the interior of the cluster, while the ionic ends are on the surface of the cluster.

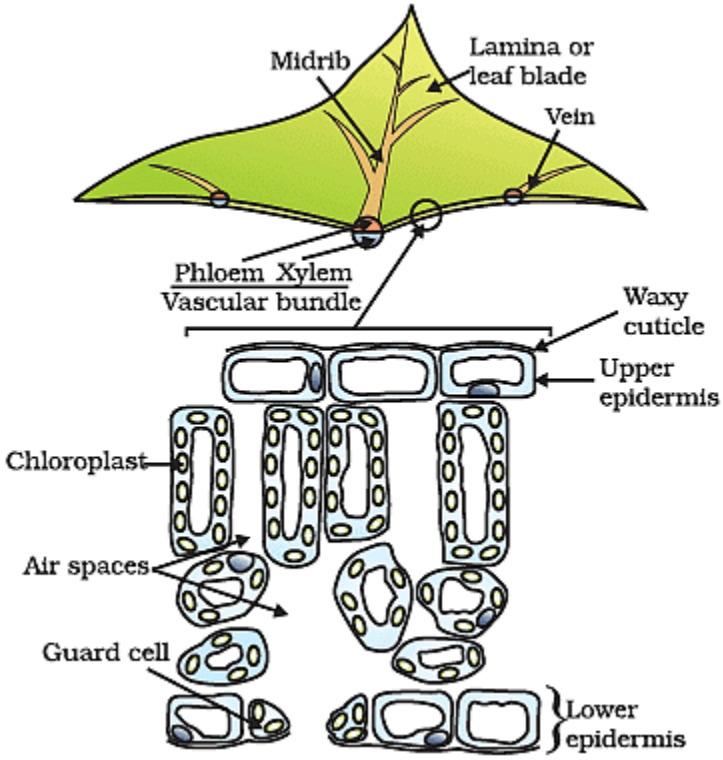
(iii) Why is soap able to clean effectively?
Ans: Soap can clean effectively because it forms micelles, which trap oily dirt in their center. The hydrophobic tails of soap surround and isolate the dirt, making it easy to rinse away with water.

(iv) Why do soap micelles stay in solution as a colloid?
Ans: Soap micelles remain in solution as a colloid due to ion-ion repulsion. The ionic ends of soap molecules on the surface of micelles repel each other, preventing the micelles from coming together to precipitate.

(v) Why does a soap solution appear cloudy?
Ans: A soap solution appears cloudy because soap micelles are large enough to scatter light. The scattering of light by these micelles gives the solution its cloudy appearance.

Life Processes

Q1: Answer the following questions based on the diagram given below:



Cross Section of a Leaf

(i) What are the green dots observed in the cells of a leaf under the microscope?
Ans: The green dots observed in the cells of a leaf under the microscope are cell organelles called chloroplasts.

(ii) What is the function of chloroplasts in plant cells?
Ans: Chloroplasts are responsible for photosynthesis, the process by which plants make their own food using sunlight, carbon dioxide, and water.

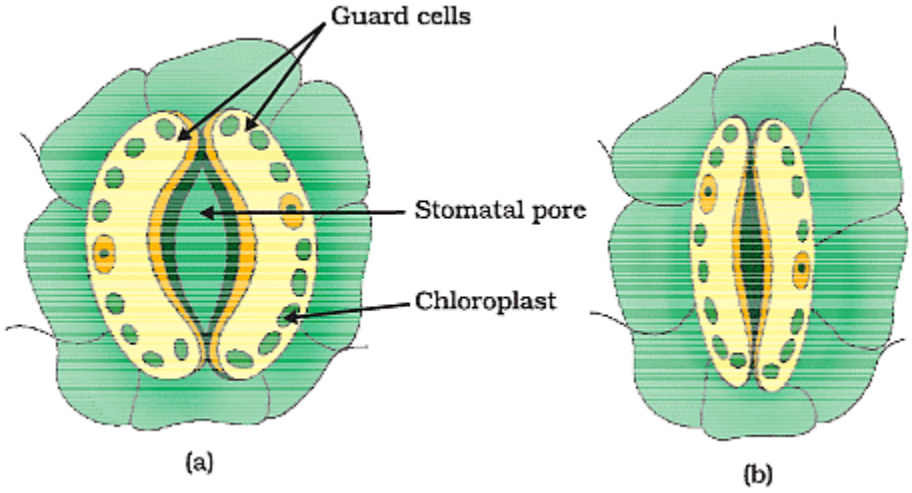
(iii) How can you demonstrate that chlorophyll is essential for photosynthesis using this experiment?
Ans: By comparing a leaf section with chlorophyll (green) to a leaf section without chlorophyll (non-green), you can show that only the green section can carry out photosynthesis, producing starch when exposed to light.

(iv) What substance should you use to test for the presence of starch in the leaf sections?

Ans: You should use iodine solution to test for the presence of starch in the leaf sections. Iodine turns blue-black in the presence of starch.

(v) Explain the role of chlorophyll in photosynthesis.
Ans: Chlorophyll absorbs sunlight and uses this energy to convert carbon dioxide and water into glucose (a sugar) and oxygen during photosynthesis. This process is essential for a plant's survival as it provides energy and food for the plant and releases oxygen into the atmosphere.

Q2: Answer the following questions based on the diagram given below:



Opening and Closing of Stomata

(i) What is the function of stomatal pores in plants?
Ans: Stomatal pores in plants are tiny openings on the surface of leaves and stems that allow for the exchange of gases, primarily carbon dioxide and oxygen. They play a crucial role in photosynthesis and respiration.

(ii) Describe the image you see that shows open stomatal pores.
Ans: In the image, you would observe that the stomatal pores are open. This means that the guard cells surrounding the pores have swollen and created an opening. This allows for the entry of carbon dioxide (CO_2) for photosynthesis and the exit of oxygen (O_2) and water vapor (H_2O) through transpiration.

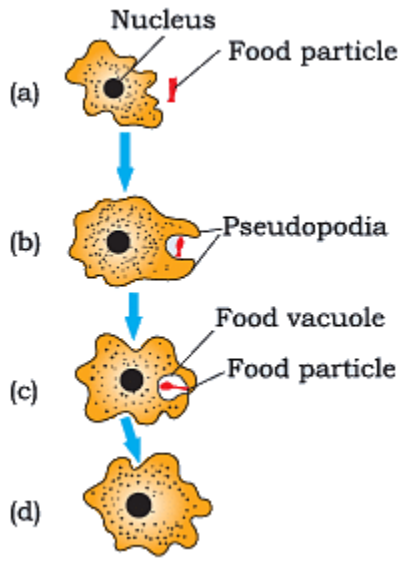
(iii) What causes stomatal pores to open and close?
Ans: Stomatal pores open and close due to changes in pressure in the guard cells. When

the guard cells take up water and become turgid, they swell and cause the stomatal pore to open. Conversely, when the guard cells lose water and become flaccid, the pore closes.

(iv) Explain the importance of stomatal regulation for a plant.
Ans: Stomatal regulation is vital for plants because it allows them to control the exchange of gases and the loss of water vapor. By opening and closing stomatal pores, plants can balance the need for carbon dioxide for photosynthesis with the need to minimize water loss through transpiration. This helps them survive in varying environmental conditions.

(v) What happens to stomatal pores during hot and dry conditions, and why?
Ans: During hot and dry conditions, stomatal pores tend to close. This is an adaptive response by the plant to reduce water loss through transpiration. Closing the stomata helps conserve water, but it can also limit the entry of carbon dioxide for photosynthesis. In such conditions, plants must strike a balance between conserving water and meeting their energy needs.

Q3: Answer the following questions based on the diagram given below:



Nutrition in Amoeba

(i) Describe the process shown in the diagram related to nutrition in Amoeba.
Ans: The diagram likely represents phagocytosis, where Amoeba engulfs food particles by extending its pseudopodia.

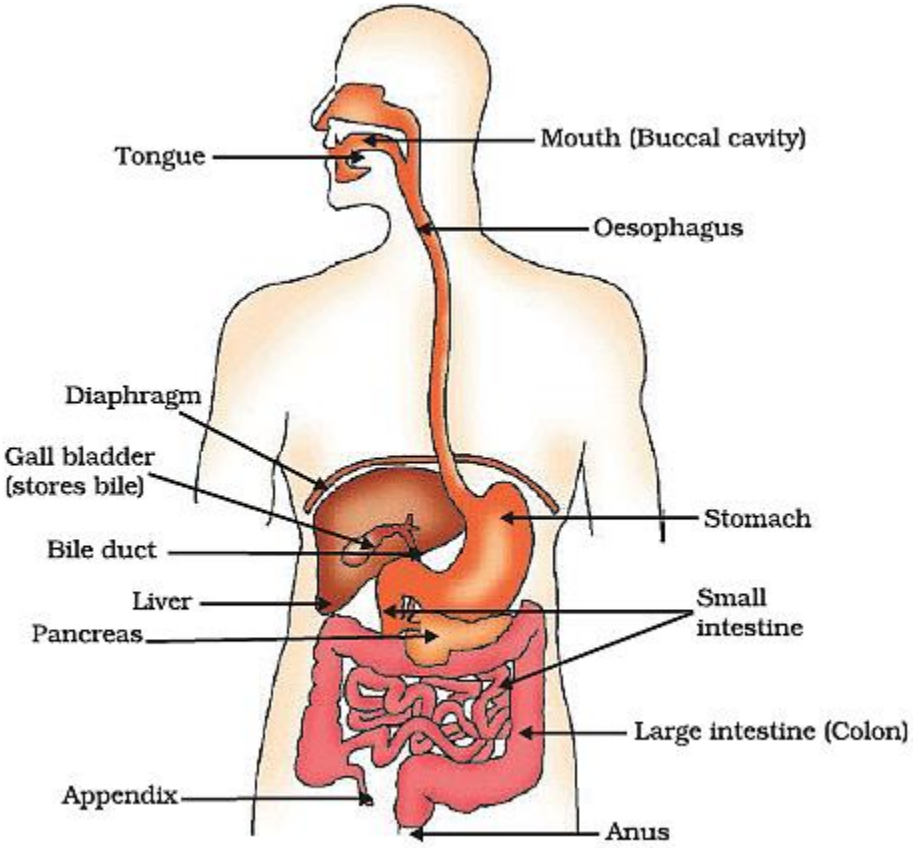
(ii) What is the primary food source for Amoeba, as indicated in the diagram?
Ans: Amoeba primarily feeds on small microorganisms or particles, such as bacteria or algae, as depicted in the diagram.

(iii) Explain the role of the contractile vacuole in the nutrition process of Amoeba.
Ans: The contractile vacuole helps regulate the water content in Amoeba by expelling excess water, maintaining osmotic balance during digestion.

(iv) What term is used to describe the process of engulfing food particles in Amoeba?
Ans: The process is called "phagocytosis," where Amoeba surrounds and engulfs food particles using pseudopodia.

(v) How does the diagram illustrate the formation of food vacuoles in Amoeba?
Ans: The diagram likely shows food vacuoles forming as a result of phagocytosis, where the engulfed food particles are enclosed in a membrane to create a food vacuole for digestion.

Q4: Answer the following questions based on the diagram given below:



Human Digestive System

(i) What is the function of the mouth in the human alimentary canal?
Ans: The mouth is the beginning of the human alimentary canal and plays a crucial role in the digestion process. Its primary functions are:

- Ingestion: It is where food enters the body.
- Mechanical Digestion: Chewing breaks down food into smaller pieces, increasing its surface area for enzymes to act upon.
- Chemical Digestion: Saliva contains enzymes (amylase) that begin the digestion of carbohydrates.

(ii) Name the three major parts of the small intestine and explain their functions.
Ans: The small intestine consists of three major parts: the duodenum, jejunum, and ileum.

- Duodenum: It receives partially digested food from the stomach and continues digestion. Bile from the liver and pancreatic juice from the pancreas enter here to aid in digestion.
- Jejunum: It is the middle part and is responsible for the absorption of nutrients, such as carbohydrates, proteins, and fats.
- Ileum: This is the final part of the small intestine where further nutrient absorption takes place, especially of vitamins and minerals.

(iii) What is the role of the stomach in the human digestive system?
Ans: The stomach has several important functions in the digestive system:

- Mixing: It mixes food with gastric juices, creating a semi-liquid substance called chyme.
- Digestion: Gastric juice contains enzymes (pepsin) that break down proteins into smaller peptides.
- Storage: The stomach temporarily stores food and regulates its release into the small intestine.

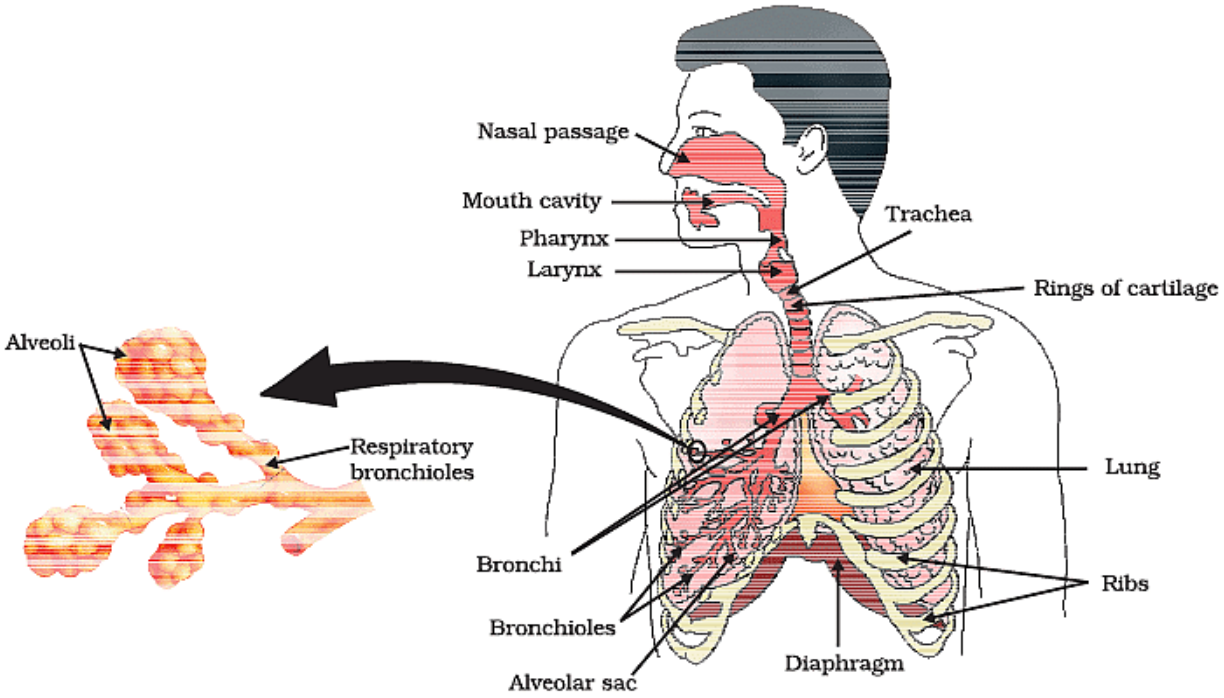
(iv) Explain the function of the pancreas in the digestive system.
Ans: The pancreas is a vital organ in digestion. Its functions include:

- Producing digestive enzymes: It releases pancreatic juice into the duodenum, which contains enzymes like amylase (for carbohydrates), lipase (for fats), and trypsin (for proteins).
- Regulating blood sugar: The pancreas also secretes insulin and glucagon, hormones that control blood sugar levels.

(v) What happens in the large intestine, and what is its role in digestion?
Ans: The large intestine, also known as the colon, performs the following functions:

- Absorption of water and electrolytes: It reabsorbs water and salts from undigested food, forming solid feces.
- Fermentation: Beneficial bacteria in the large intestine help ferment some remaining carbohydrates and produce certain vitamins.
- Storage and elimination: It stores feces until they are ready to be eliminated from the body through the rectum and anus.

Q5: Answer the following questions based on the diagram given below:



Human Respiratory System

(i) Name the primary organs involved in the human respiratory system.
Ans: The primary organs involved in the human respiratory system are the lungs.

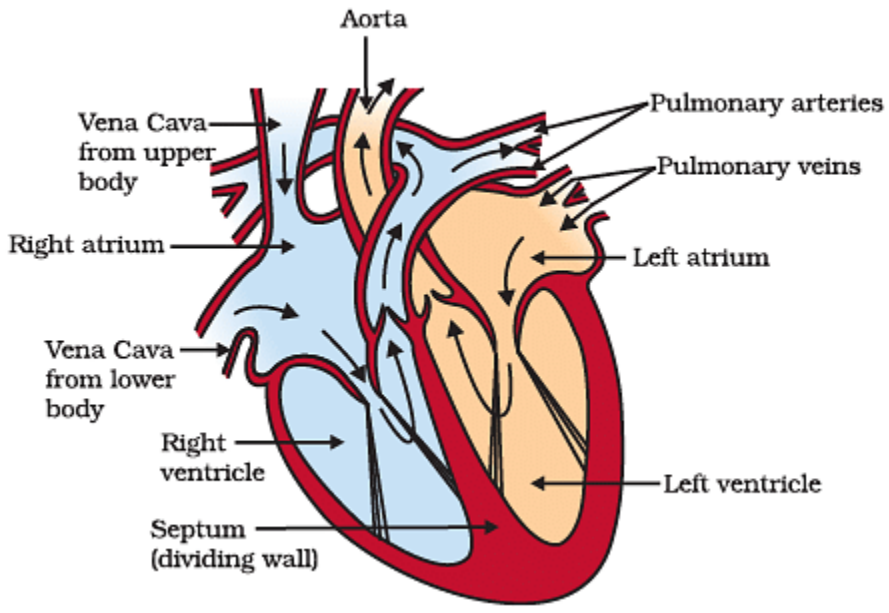
(ii) What is the main function of the respiratory system?
Ans: The main function of the respiratory system is to facilitate the exchange of oxygen (O_2) from the air with carbon dioxide (CO_2) from the body's cells.

(iii) How does the diaphragm help in the process of breathing?
Ans: The diaphragm is a muscle that contracts and flattens when you inhale, increasing the volume of the chest cavity. This action creates a vacuum, drawing air into the lungs. When it relaxes during exhalation, it pushes air out of the lungs.

(iv) What are alveoli, and why are they important in the respiratory system?
Ans: Alveoli are tiny air sacs in the lungs where the actual exchange of gases (oxygen and carbon dioxide) takes place. They have thin walls and a large surface area, which allows for efficient gas exchange between the lungs and the bloodstream.

(v) Explain the role of cilia and mucus in the respiratory system.
Ans: Cilia are tiny hair-like structures lining the respiratory tract. They move in coordinated waves to push mucus and trapped particles up and out of the respiratory system. Mucus is a sticky substance that traps dust, bacteria, and other foreign particles, preventing them from entering the lungs and causing infection.

Q6: Answer the following questions based on the diagram given below:



Human Heart

(i) Label the four chambers of the heart in the diagram.
Ans: The four chambers of the heart are labeled as follows:

1. Right Atrium
2. Right Ventricle
3. Left Atrium
4. Left Ventricle

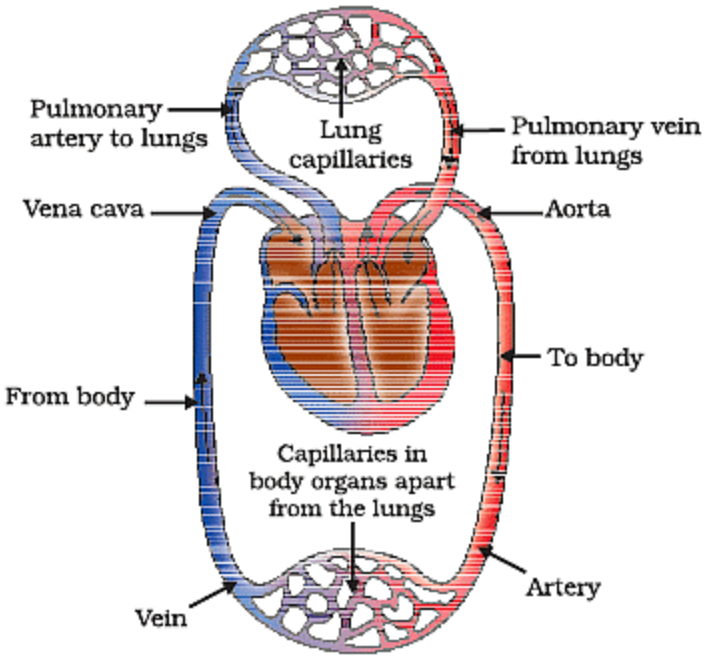
(ii) What is the function of the valves shown in the heart diagram?
Ans: The valves in the heart, such as the tricuspid and bicuspid (mitral) valves, ensure that blood flows in one direction, preventing backward flow. They help maintain the unidirectional flow of blood through the heart.

(iii) Which side of the heart pumps oxygenated blood to the body, and which side pumps deoxygenated blood to the lungs?
Ans: The left side of the heart pumps oxygenated blood to the body, while the right side pumps deoxygenated blood to the lungs for oxygenation.

(iv) Describe the pathway of blood through the heart starting from the right atrium.
Ans: Blood flows into the right atrium from the body through the superior and inferior vena cava. From the right atrium, it passes through the tricuspid valve into the right ventricle. When the right ventricle contracts, it pumps blood into the pulmonary artery, which carries it to the lungs for oxygenation.

(v) Why does the left ventricle have a thicker muscular wall compared to the right ventricle?
Ans: The left ventricle has a thicker muscular wall because it needs to pump oxygenated blood to the entire body, which requires more force. In contrast, the right ventricle only pumps blood to the nearby lungs, so it has a thinner muscular wall as it doesn't require as much force to do so.

Q7: Answer the following questions based on the diagram given below:



Exchange of Gases

(i) What are the main organs involved in the exchange of oxygen and carbon dioxide as shown in the diagram?
Ans: The main organs involved are the lungs, where the exchange takes place between air and blood, and body tissues where oxygen is used and carbon dioxide is produced.

(ii) In the diagram, what represents the red blood cells? What is their role in this process?
Ans: Red blood cells are represented by the red circles in the diagram. Their role is to transport oxygen from the lungs to body tissues and carry carbon dioxide from body tissues back to the lungs for removal.

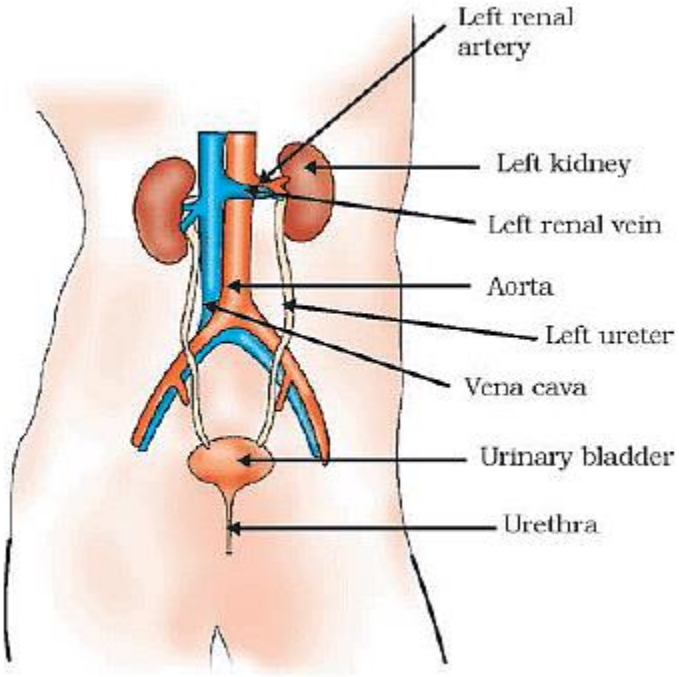
(iii) What does the blue arrow in the diagram indicate?
Ans: The blue arrow represents the flow of oxygen-rich blood from the lungs to the body tissues, delivering oxygen for cellular respiration.

(iv) Explain the role of the small blood vessels (capillaries) in the exchange of gases shown in the diagram.
Ans: Capillaries are where the actual exchange of gases occurs. They are the thin-walled blood vessels that allow oxygen to diffuse into body tissues from the bloodstream and enable carbon dioxide to diffuse out of the tissues into the bloodstream.

(v) What is the significance of the arrows going in opposite directions between the lungs and body tissues in the diagram?

Ans: The arrows going in opposite directions represent the bidirectional flow of oxygen and carbon dioxide. Oxygen is taken from the lungs to the tissues, while carbon dioxide is transported from the tissues back to the lungs for elimination. This illustrates the continuous exchange required for respiration.

Q8: Answer the following questions based on the diagram given below:



Human Excretory System

(i) What are the main organs of the human excretory system, and what are their functions?

Ans: The main organs of the human excretory system are the kidneys, ureters, urinary bladder, and urethra. The kidneys filter waste and excess substances from the blood to form urine, which is then transported by the ureters to the urinary bladder. The urinary bladder stores urine until it is eliminated from the body through the urethra.

(ii) What is the role of the nephrons in the kidneys?

Ans: Nephrons are the functional units of the kidneys. They filter blood to remove waste products, excess ions, and water, which then combine to form urine. Nephrons also help in maintaining the body's water and electrolyte balance.

(iii) How does the excretory system help in maintaining the body's internal environment?

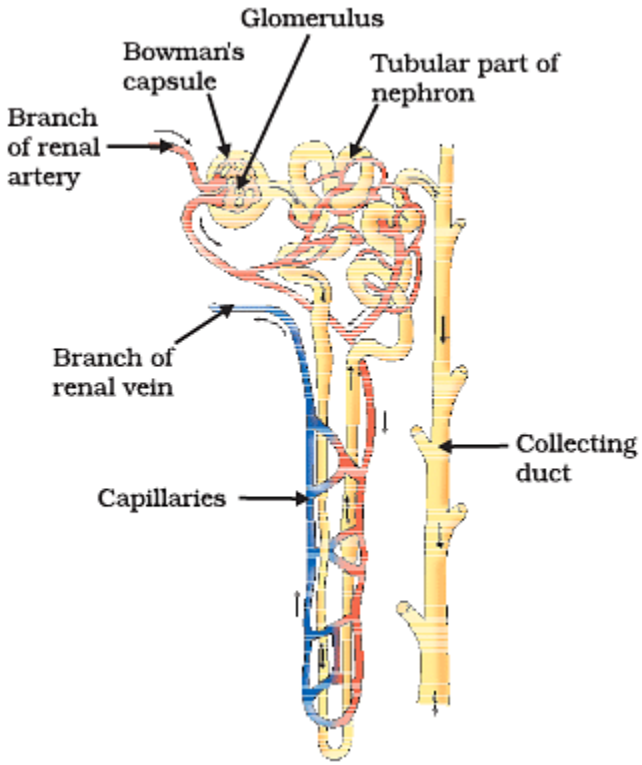
Ans: The excretory system helps maintain the body's internal environment by regulating

the balance of water and electrolytes (like sodium and potassium) in the blood. It removes waste products like urea and excess substances to keep the body's internal conditions stable.

(iv) What is the importance of the urethra in the excretory system?
Ans: The urethra is a tube that carries urine from the urinary bladder to the outside of the body. It plays a crucial role in the excretory system by allowing the elimination of urine, which contains waste products. In males, the urethra also serves as a passageway for semen during reproduction.

(v) How can we keep our excretory system healthy?
Ans: To keep the excretory system healthy, it's essential to drink plenty of water to help flush out waste products. A balanced diet with limited salt and sugar intake is also important. Regular exercise and avoiding tobacco and excessive alcohol can contribute to a healthy excretory system. Additionally, maintaining good hygiene and timely urination can prevent urinary tract infections.

Q9: Answer the following questions based on the diagram given below:



Nephron

(i) What is the main function of a nephron in the human body?
Ans: The main function of a nephron is to filter blood and remove waste products and excess substances to form urine.

(ii) Name the two main parts of a nephron and briefly describe their functions.
Ans: A nephron consists of two main parts: the renal corpuscle and the renal tubule. The renal corpuscle filters blood, while the renal tubule reabsorbs useful substances and secretes waste products.

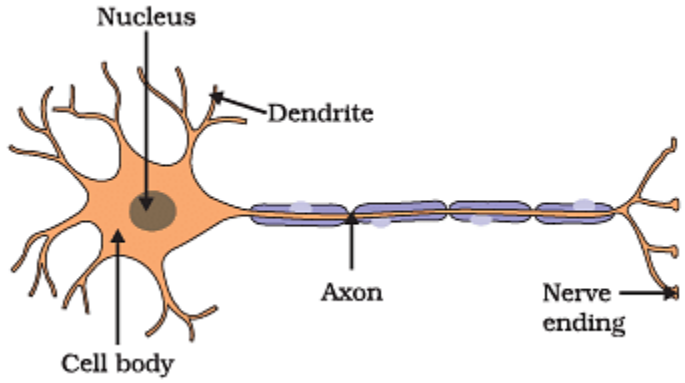
(iii) Which specific structure in the nephron is responsible for the initial filtration of blood?
Ans: The structure responsible for the initial filtration of blood in the nephron is the glomerulus, which is part of the renal corpuscle.

(iv) What is the role of the loop of Henle in the nephron?
Ans: The loop of Henle is responsible for reabsorbing water and certain salts (sodium and chloride) from the filtrate, helping to concentrate urine and regulate the body's water balance.

(v) How does the nephron help in maintaining the body's pH balance?
Ans: The nephron helps maintain the body's pH balance by selectively reabsorbing or secreting hydrogen ions and bicarbonate ions in response to changes in blood pH, helping to regulate the body's acid-base balance.

Control and Coordination

Q1: Answer the following questions based on the diagram given below:



Neuron

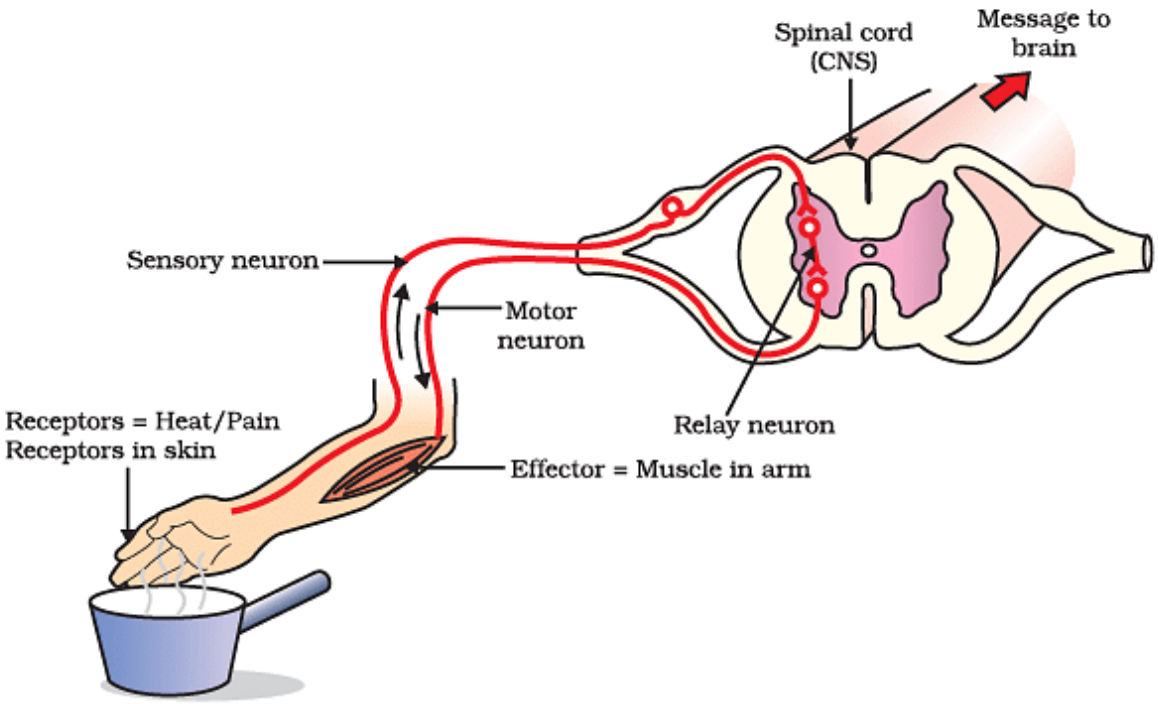
(i) What are the three main parts of a neuron?
Ans: A neuron consists of three main parts: the cell body (soma), dendrites, and an axon.

(ii) What is the function of dendrites in a neuron?
Ans: Dendrites receive electrical signals (nerve impulses) from other neurons and transmit them toward the cell body.

(iii) Explain the role of the axon in a neuron.
Ans: The axon is a long, slender projection of a neuron that carries nerve impulses away from the cell body and transmits them to other neurons or muscle cells.

(iv) How do neurons communicate with each other?
Ans: Neurons communicate with each other through small gaps called synapses. When an electrical signal (nerve impulse) reaches the end of an axon, it triggers the release of neurotransmitters, which carry the signal across the synapse to the dendrites of the next neuron.

Q2: Answer the following questions based on the diagram given below:



Reflex Arc

(i) What is a reflex arc, and why is it important for our body?
Ans: A reflex arc is a neural pathway that controls reflex actions in our body. It allows us to respond quickly to potentially harmful stimuli without conscious thought. Reflex arcs are essential for our safety and protection.

(ii) Describe the main components of a reflex arc.
Ans: A reflex arc consists of five main components:

- Receptor: Detects the stimulus.
- Sensory Neuron: Carries the signal to the spinal cord or brain.
- Integration Center: Processes the signal in the spinal cord or brain.
- Motor Neuron: Carries the response signal from the integration center.
- Effector: Executes the response (e.g., muscle contraction).

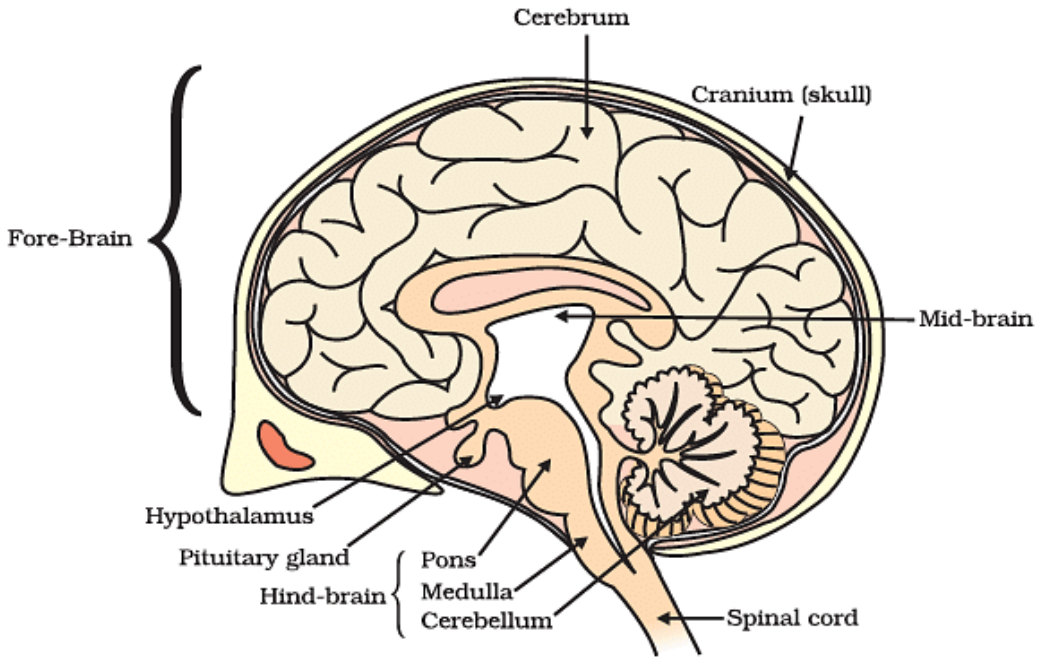
(iii) Explain a simple reflex action with an example.
Ans: A simple reflex action is an automatic response to a stimulus. For example, when you touch a hot stove, the heat receptors in your skin detect the high

temperature (receptor). The sensory neuron quickly sends a signal to the spinal cord (sensory neuron). In the spinal cord, the signal is processed, and a response is generated (integration center). The response is to withdraw your hand from the stove, which is carried out by the motor neuron (motor neuron) and the muscles in your arm (effector).

(iv) How does a reflex action differ from a voluntary action?
Ans: A reflex action is an involuntary and automatic response to a stimulus. It occurs rapidly and does not involve conscious thought. In contrast, a voluntary action is a deliberate and conscious movement or decision made by the brain, such as raising your hand to answer a question in class.

(v) Can you explain the role of the spinal cord in a reflex arc?
Ans: The spinal cord plays a crucial role in a reflex arc. It serves as an integration center where the sensory signal is processed and a response is generated. This allows for a quick and automatic response to a stimulus without the need for the signal to travel all the way to the brain. The spinal cord acts as a relay station, facilitating rapid reflex actions for our safety.

Q3: Answer the following questions based on the diagram given below:



Human Brain

(i) What are the main parts of the human brain shown in the diagram, and what are their functions?
Ans: The human brain consists of three main parts: the cerebrum, cerebellum, and brainstem. The cerebrum is responsible for thinking, memory, and voluntary movements. The cerebellum controls balance and coordination, while the brainstem regulates essential functions like breathing and heartbeat.

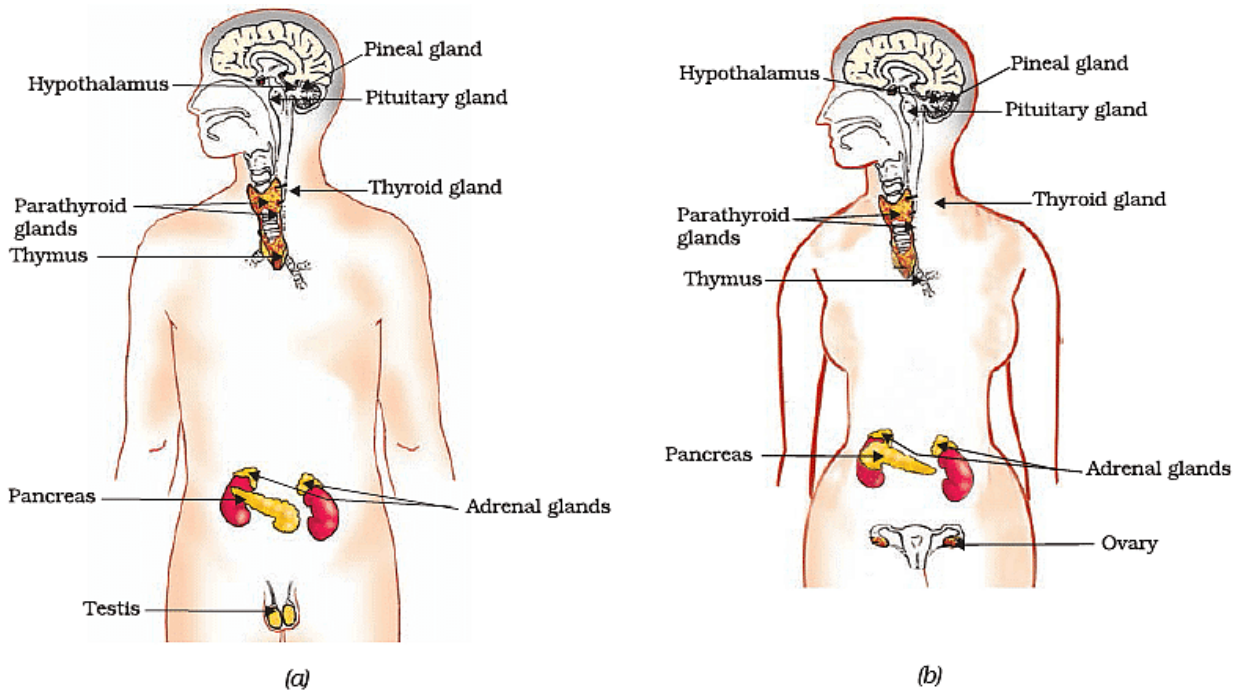
(ii) Can you identify the two hemispheres of the brain in the diagram? What is the significance of the left and right hemispheres?
Ans: Yes, the diagram shows two hemispheres, the left and right. The left hemisphere is typically associated with language, logic, and analytical thinking. The right hemisphere is linked to creativity, emotions, and spatial awareness.

(iii) In the image, there are several convoluted ridges and grooves on the brain's surface. What are these structures called, and why are they important?
Ans: The convoluted ridges and grooves on the brain's surface are called "gyri" (ridges) and "sulci" (grooves). These structures increase the brain's surface area, allowing for more neurons and a higher processing capacity.

(iv) Locate and describe the role of the hypothalamus in the diagram. What functions are associated with this part of the brain?
Ans: The hypothalamus is located at the base of the brain and helps regulate many important functions, including body temperature, hunger, thirst, and the sleep-wake cycle. It also controls the release of hormones from the pituitary gland.

(v) Point out the spinal cord's connection to the brain in the diagram. What is the role of the spinal cord, and how does it relate to the brain's function?
Ans: The spinal cord is connected to the brainstem and extends down the vertebral column. It serves as a relay between the brain and the rest of the body, transmitting signals for movement and sensation. It plays a vital role in reflex actions and the coordination of bodily functions.

Q4: Answer the following questions based on the diagram given below:



Endocrine system of Male and Female

(i) What is the primary function of the endocrine glands shown in the diagram for both males and females?

Ans: Endocrine glands are special parts of our body that release hormones. Hormones are chemical messengers that travel through the blood to help control different functions in the body, like how we grow, how our body uses energy, and how we handle stress.

(ii) Identify the endocrine gland labeled in the diagram that is responsible for regulating metabolism.

Ans: The thyroid gland is responsible for regulating metabolism.

(iii) Which endocrine gland in the diagram is unique to males and plays a crucial role in the production of sperm and male secondary sexual characteristics?

Ans: The testes are unique to males and are responsible for sperm production and male secondary sexual characteristics.

(iv) Name the endocrine gland in the diagram that controls blood sugar levels by secreting insulin and glucagon.

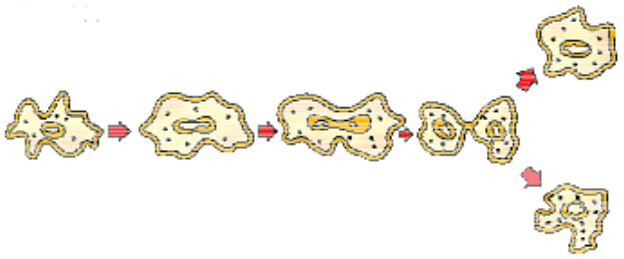
Ans: The pancreas controls blood sugar levels by secreting insulin and glucagon.

(v) Identify the endocrine gland in the diagram that is responsible for producing hormones like estrogen and progesterone, important for female secondary sexual characteristics and the menstrual cycle.

Ans: The ovaries produce hormones like estrogen and progesterone, which are important for female secondary sexual characteristics and the menstrual cycle.

How do Organisms Reproduce?

Q1: Answer the following questions based on the diagram given below:



(i) What is binary fission in Amoeba?
Ans: Binary fission in Amoeba is a process where a single Amoeba cell divides into two identical daughter cells. It's a form of asexual reproduction.

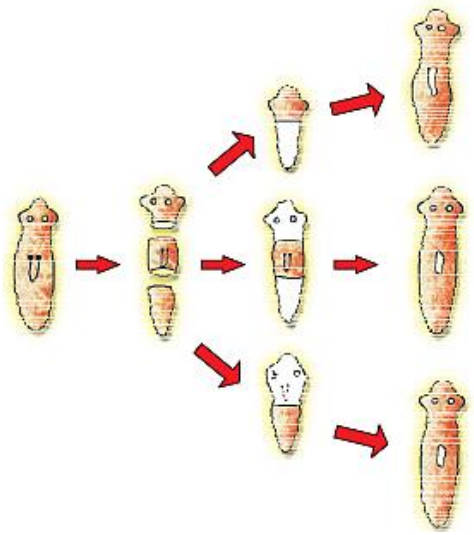
(ii) Describe the key stages of binary fission in Amoeba.
Ans: In binary fission, the Amoeba undergoes stages such as elongation, nucleus division, cell membrane formation, and ultimately, the separation of two daughter cells.

(iii) How does binary fission differ from sexual reproduction in Amoeba?
Ans: Binary fission is asexual reproduction, producing genetically identical offspring, while sexual reproduction involves the fusion of two different gametes, leading to genetic variation in offspring.

(iv) What is the significance of binary fission in the life of Amoeba?
Ans: Binary fission is vital for the survival and propagation of Amoeba because it helps in rapid reproduction and population growth under favorable conditions.

(v) Explain how environmental factors can influence the frequency of binary fission in Amoeba.
Ans: Environmental factors such as temperature, food availability, and water quality can affect the frequency of binary fission in Amoeba. Warmer temperatures and ample food resources often lead to more frequent reproduction, while adverse conditions may slow it down or halt it altogether.

Q2: Answer the following questions based on the diagram given below:



(i) What is the organism shown in the diagram, and why is it important for the study of regeneration?

Ans: The organism in the diagram is a Planaria, a type of flatworm. It is important for the study of regeneration because it has the remarkable ability to regrow lost body parts.

(ii) In the diagram, what body part of the Planaria is being cut or removed for the experiment, and why?

Ans: In the diagram, a portion of the Planaria's body, usually the tail or head, is being cut or removed. This is done to observe the process of regeneration, where the Planaria can regrow the missing body part.

(iii) What do you expect to happen after the Planaria's body part is removed, based on the experiment?

Ans: After the body part is removed, we expect the Planaria to regenerate or grow back the missing body part over time.

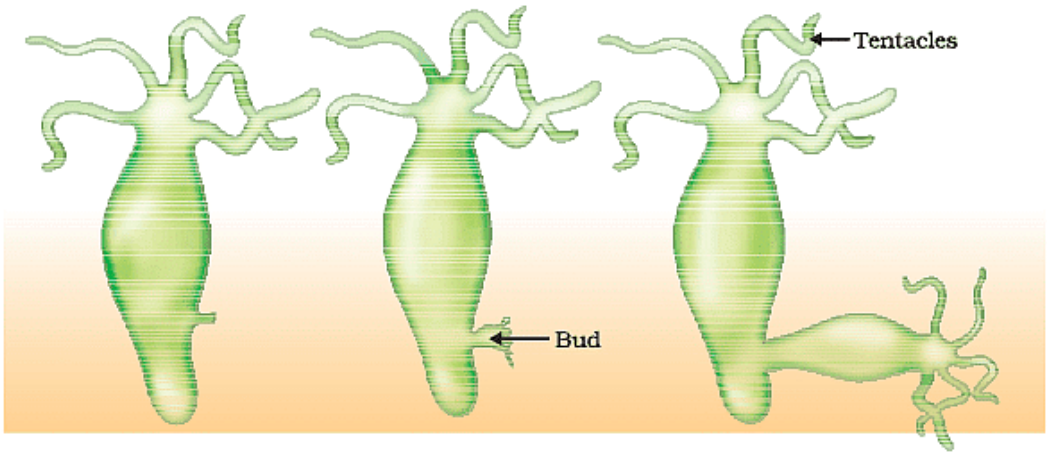
(iv) How does the ability of Planaria to regenerate its body parts relate to the concept of asexual reproduction?

Ans: The ability of Planaria to regenerate its body parts is a form of asexual reproduction. When it regrows a missing body part, it essentially creates a new individual that is genetically identical to the original.

(v) What is the significance of studying regeneration in Planaria for scientific research and potential medical applications?

Ans: Studying regeneration in Planaria can provide insights into the regenerative capabilities of living organisms. This knowledge may have applications in fields such as regenerative medicine, tissue engineering, and the development of treatments for injuries and diseases in humans.

Q3: Answer the following questions based on the diagram given below:



(i) What is budding in Hydra, and how does it differ from other forms of reproduction in animals?
Ans: Budding in Hydra is a form of asexual reproduction where a small outgrowth or bud develops on the body of the parent Hydra and eventually detaches to form a new individual. This is different from sexual reproduction, where offspring are produced by the fusion of gametes (sperm and egg).

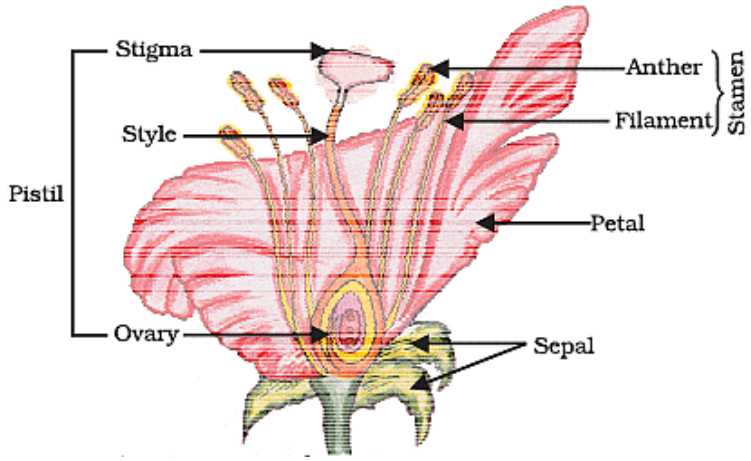
(ii) Explain the process of budding in Hydra using a labeled diagram.
Ans: Budding in Hydra starts with the formation of a small bud on the body of the parent Hydra. The bud grows in size and eventually detaches from the parent to become a new Hydra. The process involves the development of tentacles, a mouth, and a foot in the bud.

(iii) What advantages does budding offer to Hydra as a mode of reproduction?
Ans: Budding allows Hydra to reproduce quickly without the need for a mate. This can be advantageous in rapidly colonizing environments and ensures the continuity of the species even when suitable mates may not be available.

(iv) Can you name another organism besides Hydra that reproduces through budding?
Ans: Yeast is another organism that reproduces through budding. In yeast, a small bud forms on the parent cell, grows, and eventually separates to become a new yeast cell.

(v) What are the different stages in the life cycle of Hydra, and how does budding fit into this cycle?
Ans: The life cycle of Hydra typically consists of two stages: the adult polyp stage and the medusa stage. Budding occurs during the adult polyp stage, where a bud develops on the parent Hydra and forms a new individual. This asexual reproduction helps in the expansion of the Hydra population. The medusa stage, on the other hand, is usually involved in sexual reproduction.

Q4: Answer the following questions based on the diagram given below:



(i) What is the main purpose of a longitudinal section of a flower?
Ans: A longitudinal section of a flower is prepared to study the internal structures of a flower, such as its reproductive parts, to understand how pollination and fertilization occur.

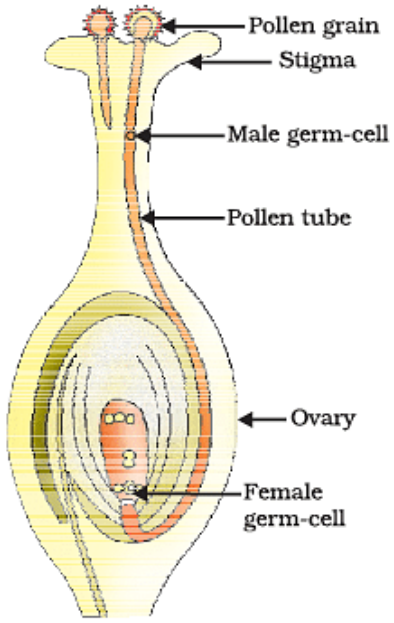
(ii) Name the male and female reproductive parts of a flower seen in the longitudinal section.
Ans: In a typical flower's longitudinal section, the male reproductive part is called the stamen, consisting of anther and filament, while the female reproductive part is called the pistil, which includes the stigma, style, and ovary.

(iii) What is the function of the anther in a flower's reproductive process?
Ans: The anther is the part of the stamen that produces pollen grains. Its function is to release pollen, which contains male gametes, into the environment for the purpose of fertilizing the female reproductive organ (ovule) of another flower.

(iv) Explain why the stigma is an essential part of the pistil in a flower.
Ans: The stigma is a sticky structure at the top of the pistil. Its role is crucial as it captures pollen grains from other flowers. This sticky surface allows pollen grains to adhere to it, facilitating the process of pollination.

(v) What is the ultimate aim of the fertilization process in a flower?
Ans: The main goal of fertilization in a flower is to combine the male and female gametes, resulting in the formation of a fertilized egg (zygote). This fertilized egg eventually develops into a seed within the ovary, ensuring the continuation of the plant's life cycle.

Q5: Answer the following questions based on the diagram given below:



(i) What is the process called when pollen lands on the stigma of a flower?
Ans: The process is called "pollination" when pollen lands on the stigma of a flower.

(ii) What is the main purpose of the pollen grain in the process of germination on the stigma?

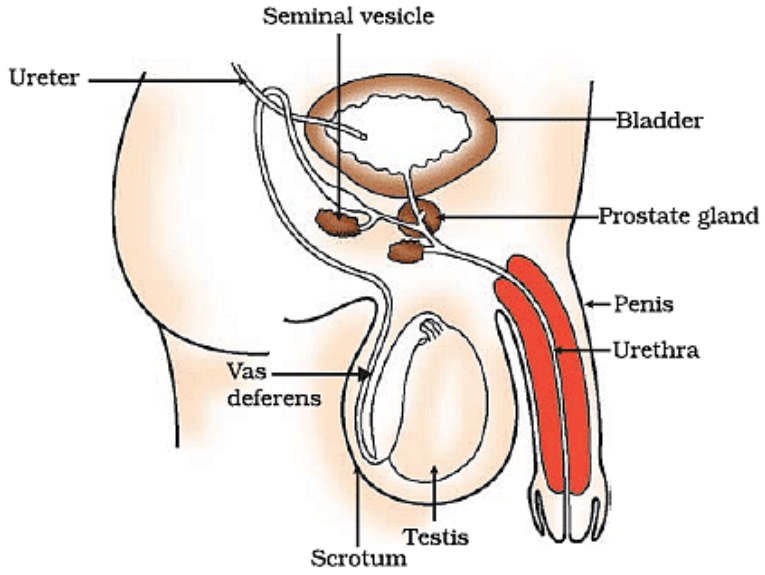
Ans: The main purpose of the pollen grain is to deliver male gametes (sperm cells) to the female reproductive part of the flower (the stigma) for fertilization.

(iii) How does the pollen grain reach the stigma of a flower?
Ans: The pollen grain is carried to the stigma either by the wind (wind pollination) or by pollinators such as insects, birds, or bats (animal pollination).

(iv) What happens to the pollen grain once it lands on the stigma?
Ans: Once the pollen grain lands on the stigma, it germinates. The pollen tube begins to grow down through the style towards the ovule, carrying male gametes to fertilize the egg cell.

(v) Why is germination of pollen on the stigma essential for plant reproduction?
Ans: Germination of pollen on the stigma is essential for plant reproduction because it is the first step in the fertilization process. It allows the male gametes from the pollen grain to reach the female gametes in the ovule, leading to the formation of seeds and the continuation of the plant species.

Q6: Answer the following questions based on the diagram given below:



(i) What are the primary organs of the male reproductive system?
Ans: The primary organs of the male reproductive system are the testes, epididymis, vas deferens, and penis.

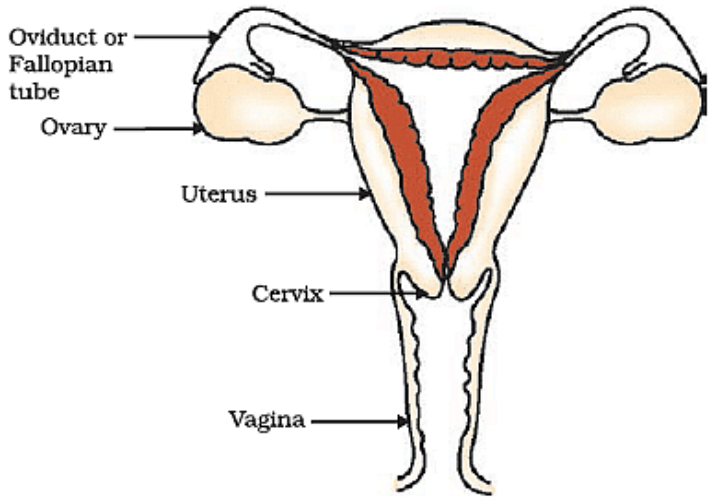
(ii) What is the function of the testes in the male reproductive system?
Ans: The testes are responsible for producing sperm cells and secreting the male sex hormone, testosterone.

(iii) How does sperm move from the testes to the urethra?
Ans: Sperm move from the testes to the urethra through a tube called the vas deferens, which connects the testes to the urethra.

(iv) What is the role of the epididymis in the male reproductive system?
Ans: The epididymis is a coiled tube where sperm are stored, mature, and gain the ability to swim and fertilize an egg.

(v) What is the function of the penis in the male reproductive system?
Ans: The penis is the external organ that delivers sperm into the female reproductive system during sexual intercourse.

Q7: Answer the following questions based on the diagram given below:



(i) What are the main organs of the female reproductive system, and what are their functions?
Ans: The main organs of the female reproductive system are the ovaries, fallopian tubes, uterus, cervix, and vagina. The ovaries produce eggs and hormones, while the uterus is responsible for nurturing a developing embryo, and the fallopian tubes help transport the egg from the ovary to the uterus.

(ii) What is menstruation, and what is its significance in the female reproductive system?
Ans: Menstruation is the monthly shedding of the uterine lining. It is significant because it prepares the uterus for potential pregnancy and is a crucial part of the female reproductive cycle.

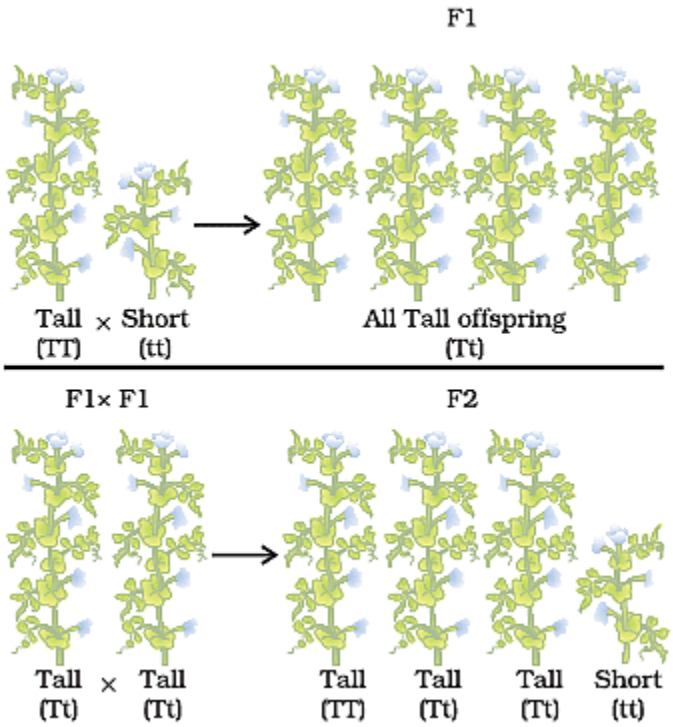
(iii) What is ovulation, and when does it typically occur in the menstrual cycle?
Ans: Ovulation is the release of a mature egg from the ovary. It usually occurs around the middle of the menstrual cycle, approximately on the 14th day of a 28-day cycle.

(iv) What is fertilization, and where does it usually occur in the female reproductive system?
Ans: Fertilization is the fusion of a sperm cell and an egg cell, resulting in the formation of a zygote. It typically occurs in the fallopian tubes, shortly after ovulation.

(v) What are the stages of pregnancy, and how does the female reproductive system support the developing fetus?
Ans: Pregnancy has three trimesters, each with its own developmental milestones. The female reproductive system supports the fetus by providing a nourishing environment within the uterus, where the baby develops and receives nutrients through the placenta.

Heredity

Q1: Answer the following questions based on the diagram given below:



(i) What is a monohybrid cross, and why is it important in the study of genetics?
Ans: A monohybrid cross is a genetic experiment that involves the mating of two individuals that differ in only one trait, typically with one being dominant and the other recessive. It helps us understand how traits are inherited from one generation to the next.

(ii) In the monohybrid cross experiment, what do the letters 'P' and 'F1' represent?
Ans: In the monohybrid cross experiment:

- 'P' represents the parental generation, which consists of the two original individuals being crossed.
- 'F1' represents the first filial generation, which are the offspring resulting from the mating of the parental generation.

(iii) What is meant by the terms 'dominant' and 'recessive' in the context of monohybrid crosses?

Ans: In monohybrid crosses, a 'dominant' trait is one that is expressed when present, while a 'recessive' trait is only expressed when both alleles for the trait are recessive (homozygous recessive). Dominant traits mask the expression of recessive traits.

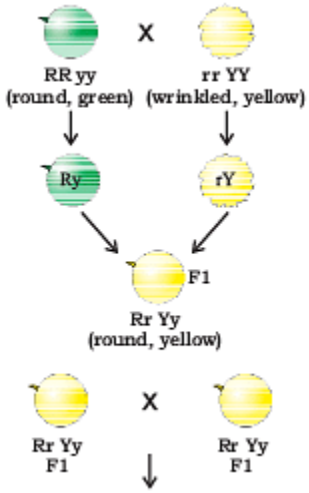
(iv) If you cross two individuals with the genotype 'TT' and 'tt' for a particular trait, what will be the genotype of their offspring in the F1 generation?

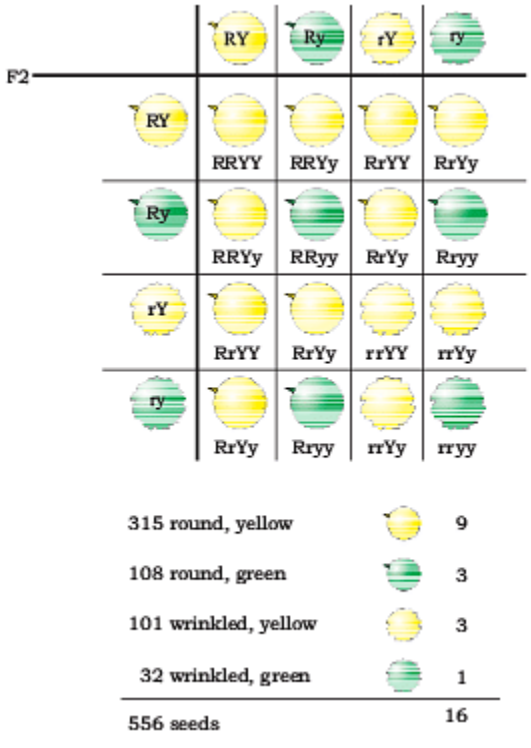
Ans: In the F1 generation, the offspring will have a genotype of 'Tt.' This is because one parent has two dominant alleles ('TT'), and the other parent has two recessive alleles ('tt').

(v) What is the expected phenotypic ratio in the F2 generation if you cross two heterozygous individuals ('Tt') from the F1 generation?

Ans: When two heterozygous individuals ('Tt') from the F1 generation are crossed, the expected phenotypic ratio in the F2 generation is 3:1. This means that three-quarters of the offspring will exhibit the dominant trait (expressing 'T'), and one-quarter will exhibit the recessive trait (expressing 't').

Q2: Answer the following questions based on the diagram given below:





(i) What is the experiment about?
Ans: The experiment is about studying the inheritance of two separate traits, specifically the shape and color of seeds in pea plants.

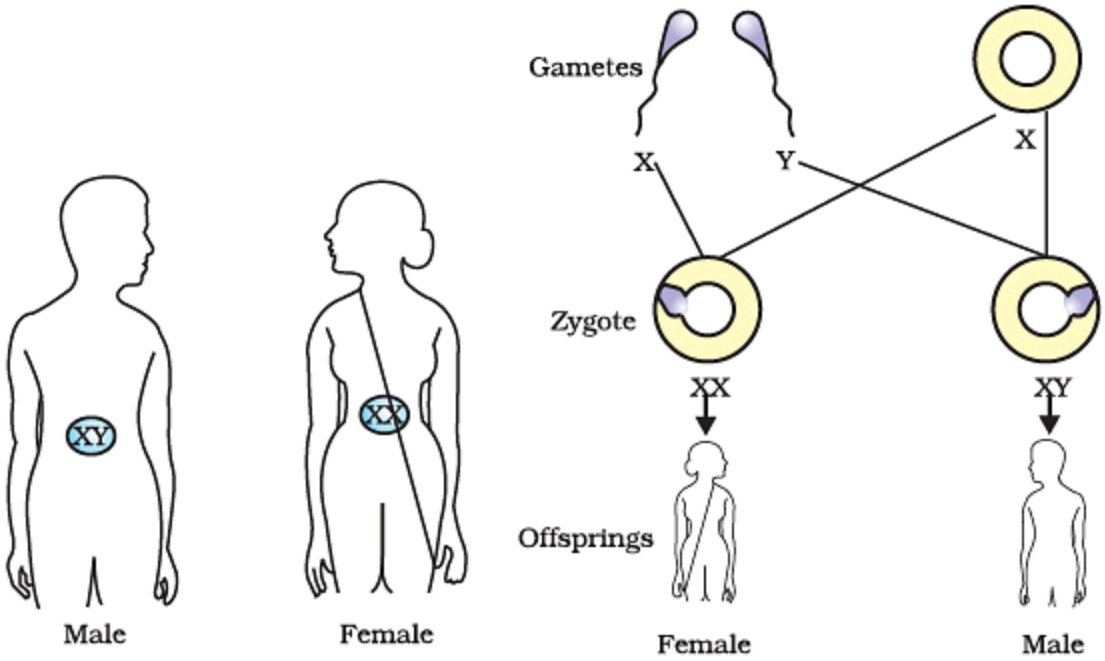
(ii) How do genes control characteristics or traits in organisms?
Ans: Genes control characteristics or traits by providing instructions for making proteins. These proteins, in turn, influence specific traits such as plant height or seed shape and color.

(iii) How does sexual reproduction ensure that both parents contribute to the traits of their progeny?
Ans: Sexual reproduction ensures that both parents contribute equally to the traits of their progeny by each parent providing a copy of the same gene. This is because germ cells (sperm and egg cells) have only one set of genes, ensuring the mixing of genetic material from both parents during fertilization.

(iv) Why is it important for germ cells to have only one set of genes?
Ans: Germ cells have only one set of genes to ensure that when they combine during fertilization, the progeny receive the normal number of chromosomes with a mix of genetic material from both parents. This ensures genetic diversity and the stability of the species' DNA.

(v) How does the independent inheritance of traits, as shown in the experiment, work?
Ans: Independent inheritance of traits occurs because genes are located on separate independent pieces called chromosomes. When germ cells combine, they bring together chromosomes from both parents, allowing traits like seed shape and color to be inherited independently, as observed in the experiment.

Q3: Answer the following questions based on the diagram given below:



(i) In the diagram, what are the two types of sex chromosomes shown in human beings?
Ans: The two types of sex chromosomes shown are X and Y chromosomes.

(ii) Based on the image, which parent determines the sex of the offspring in humans?
Ans: The father determines the sex of the offspring by contributing either an X or a Y chromosome.

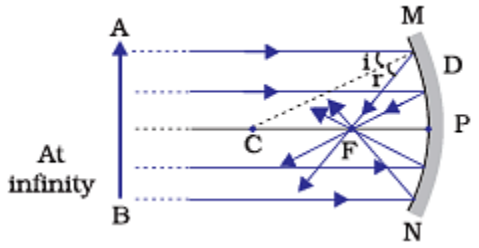
(iii) What is the significance of the pink and blue colors in the diagram representing the chromosomes?
Ans: The pink color represents X chromosomes, and the blue color represents Y chromosomes. These colors indicate the different types of sex chromosomes.

(iv) How is the sex of a baby determined by the combination of X and Y chromosomes shown in the diagram?
Ans: If an X chromosome from the mother combines with an X chromosome from the father (XX), the baby will be female. If an X chromosome from the mother combines with a Y chromosome from the father (XY), the baby will be male.

(v) What is the probability of having a male or female child based on the information provided in the diagram?
Ans: The probability of having a male (XY) or female (XX) child is 50%, as it depends on whether the father contributes an X or a Y chromosome.

Reflection and Refraction

Q1: Answer the following questions based on the diagram given below:



(i) What is a converging mirror, and how does it differ from a diverging mirror?
Ans: A converging mirror, also known as a concave mirror, is a curved mirror with an inward-curved reflecting surface. It reflects light rays in such a way that they converge or come together at a point. In contrast, a diverging mirror (convex mirror) has an outward-curved reflecting surface and causes light rays to diverge or spread out.

(ii) Explain how the image formed by a converging mirror depends on the object's distance from the mirror.
Ans: The image formed by a converging mirror can be real or virtual, depending on the object's position:

- When the object is placed beyond the mirror's focal point (F), a real and inverted image is formed.
- When the object is placed between the focal point (F) and the mirror, a virtual and upright image is formed.
- If the object is placed at the focal point (F), no image is formed, and the rays are parallel after reflection.

(iii) How can you determine the focal length of a converging mirror experimentally?
Ans: The focal length of a converging mirror can be determined experimentally using the "two-ray method." This involves:

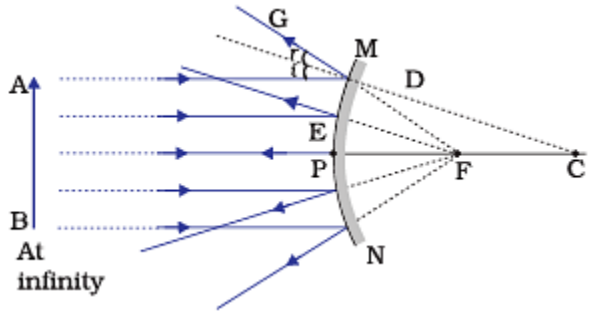
- Placing an object (such as a candle) in front of the mirror at a known distance.
- Marking the location of the image formed by the mirror.

- Measuring the object distance (u) and the image distance (v).
- Using the mirror formula, 1/f = 1/v + 1/u, to calculate the focal length (f).

(iv) Explain the term "principal focus" of a converging mirror.
Ans: The principal focus of a converging mirror (concave mirror) is a point on its principal axis where parallel rays of light, when incident on the mirror, converge or appear to converge after reflection. It is denoted as "F" and is one-half of the focal length. Rays parallel to the principal axis are reflected through this point after interacting with the mirror.

(v) State one common use of a converging mirror in everyday life.
Ans: One common use of a converging mirror is in makeup mirrors or shaving mirrors. Converging mirrors produce upright and virtual images, making it easier to see a magnified view of one's face while applying makeup or shaving. This allows for a more detailed and accurate reflection.

Q2: Answer the following questions based on the diagram given below:



(i) What is the shape of a diverging mirror?
Ans: A diverging mirror has a curved reflective surface that bulges outward, giving it a shape similar to the outer surface of a sphere. It is also called a convex mirror.

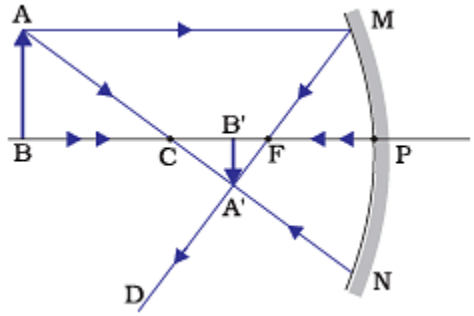
(ii) How does the image formed by a diverging mirror differ from that formed by a converging mirror?
Ans: The image formed by a diverging mirror is virtual, erect (upright), and diminished (smaller in size) compared to the object. In contrast, a converging mirror (concave mirror) can form real or virtual images, which can be either magnified or diminished depending on the object's position.

(iii) What happens to the rays of light that strike a diverging mirror?
Ans: When parallel rays of light strike a diverging mirror, they diverge or spread out, reflecting away from each other. This is why it's called a diverging mirror.

(iv) Explain how the image position changes when you move an object closer to a diverging mirror.
Ans: As you move an object closer to a diverging mirror, the virtual image formed by the mirror moves farther away from the mirror and becomes smaller in size. The image remains virtual and erect.

(v) What are some real-world applications of diverging mirrors?
Ans: Diverging mirrors are commonly used in side mirrors of vehicles such as cars and bikes. They provide a wide field of view, allowing the driver to see objects behind and to the sides of the vehicle. The smaller and erect virtual image helps in judging the relative positions of objects in traffic.

Q3: Answer the following questions based on the diagram given below:



(i) What happens to the image when the object is placed at the center of curvature (C) of a concave mirror?
Ans: When the object is placed at the center of curvature (C) of a concave mirror, the image is formed at the same location, also at the center of curvature. The image is real, inverted, and of the same size as the object.

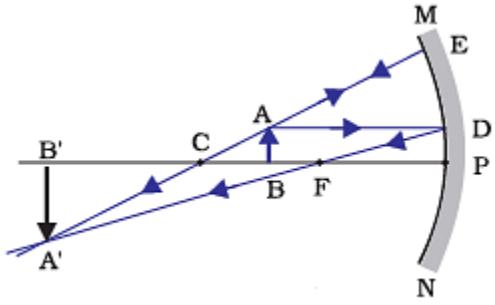
(ii) How does the size of the image formed by a concave mirror change when the object is moved from C towards the focus (F)?
Ans: As the object is moved from C towards the focus (F) of a concave mirror, the size of the image gradually increases. It becomes larger than the object, but it remains real and inverted.

(iii) What happens to the image formed by a concave mirror when the object is placed between the center of curvature (C) and the focus (F)?
Ans: When the object is placed between the center of curvature (C) and the focus (F) of a concave mirror, the image is formed beyond the center of curvature. It is real, inverted, and magnified.

(iv) Describe the nature of the image formed by a concave mirror when the object is placed at the focus (F).
Ans: When the object is placed at the focus (F) of a concave mirror, no real image is formed. Instead, the reflected rays appear to diverge from the mirror, and they do not meet. Therefore, the image is said to be formed at infinity, and it is highly magnified.

(v) What happens to the image formed by a concave mirror when the object is moved closer to the mirror beyond the focus (F)?
Ans: When the object is moved closer to the mirror beyond the focus (F) of a concave mirror, the image is formed on the same side as the object, and it appears to be virtual, erect, and highly magnified. It cannot be obtained on a screen.

Q4: Answer the following questions based on the diagram given below:



(i) What happens to the rays of light when an object is placed at the focal point (F) of a concave mirror?
Ans: When an object is placed at the focal point (F) of a concave mirror, the rays of light become parallel after reflection.

(ii) Describe the type of image formed when an object is placed at the focal point (F) of a concave mirror.
Ans: When an object is placed at the focal point (F) of a concave mirror, no real image is

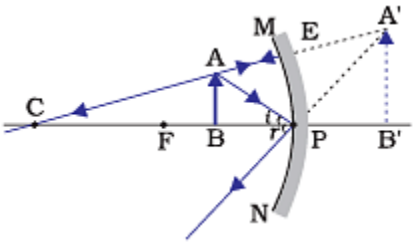
formed. Instead, the reflected rays diverge and appear to be coming from a point behind the mirror. This virtual image is highly magnified and cannot be projected onto a screen.

(iii) How does the image formed when an object is placed at the center of curvature (C) of a concave mirror differ from other positions?
Ans: When an object is placed at the center of curvature (C) of a concave mirror, the image formed is real, inverted, and of the same size as the object. It is also located at the same distance as the object but on the opposite side of the mirror.

(iv) What is the principal focus of a concave mirror, and how is it related to the focal length?
Ans: The principal focus of a concave mirror is the point where parallel rays of light either converge (in the case of a concave mirror) or appear to diverge from (in the case of a convex mirror) after reflection. The focal length (f) is the distance between the mirror's pole and its principal focus. In a concave mirror, the focal length is positive.

(v) Explain why a concave mirror is called a converging mirror and give an example of its real-world use.
Ans: A concave mirror is called a converging mirror because it brings parallel rays of light together after reflection. An example of its real-world use is in a makeup mirror, where it is used to form a magnified and clear virtual image of the face, allowing for precise makeup application.

Q5: Answer the following questions based on the diagram given below:



(i) What happens when an object is placed at the focus (F) of a concave mirror?
Ans: When an object is placed at the focus (F) of a concave mirror, no real image is formed. Instead, the rays of light diverge and appear to be coming from behind the mirror. This image is virtual, erect, and highly magnified.

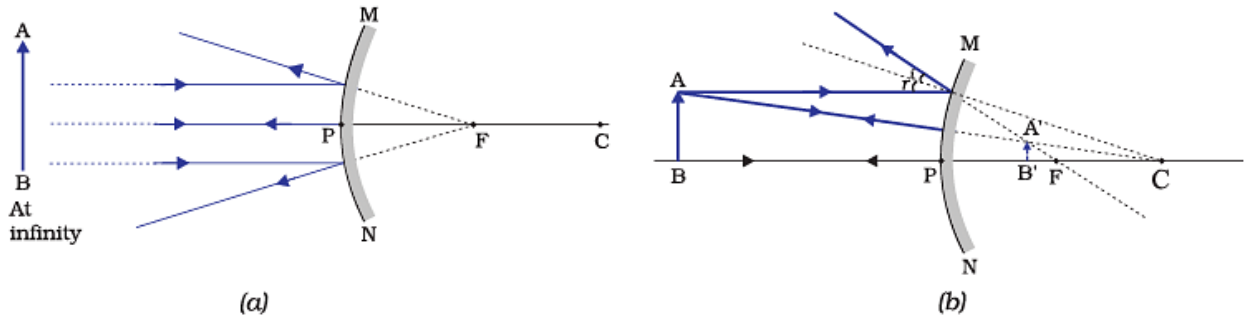
(ii) How does the size of the image formed when the object is at the focus compare to the size of the object?
Ans: When the object is placed at the focus (F) of a concave mirror, the size of the image becomes infinitely large or highly magnified compared to the size of the object.

(iii) Where is the image formed when the object is placed between the focus (F) and the pole (P) of a concave mirror?
Ans: When the object is placed between the focus (F) and the pole (P) of a concave mirror, the image is formed on the same side as the object. It is virtual, erect, and magnified.

(iv) How does the nature of the image change as the object moves from beyond the focus to between the focus and the pole?
Ans: As the object moves from beyond the focus towards the focus and between the focus and the pole, the image changes from being real, inverted, and diminished to being virtual, erect, and magnified.

(v) What is the special point of a concave mirror where the incident rays converge or appear to converge after reflection?
Ans: The special point of a concave mirror where incident rays either converge or appear to converge after reflection is called the focus (F) of the mirror. It is one of the key characteristics of a concave mirror's behavior.

Q6: Answer the following questions based on the diagram given below:



(i) What is the type of mirror used in this experiment, and how can you identify it?
Ans: The type of mirror used in this experiment is a convex mirror. You can identify it by its outward-curved reflective surface, which bulges outward like the back of a spoon.

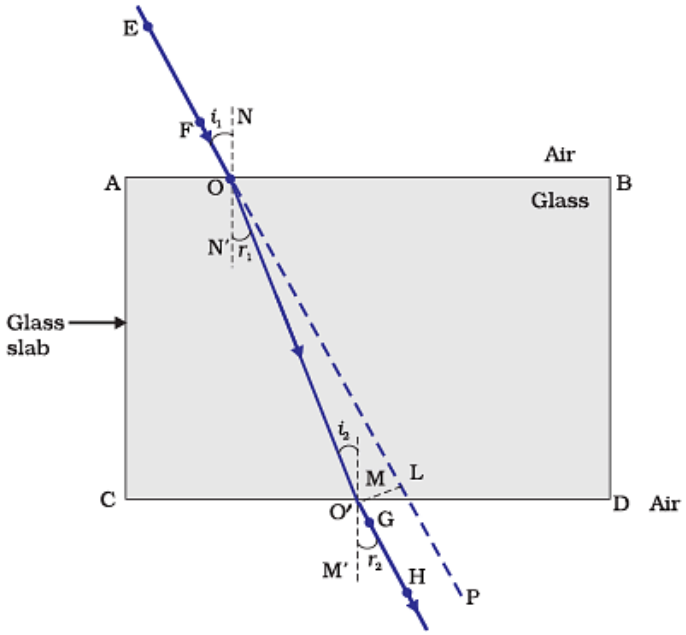
(ii) Where is the object placed in this experiment when it is said to be "placed at P"?
Ans: When the object is said to be "placed at P," it is positioned at the principal focus (F) of the convex mirror.

(iii) What happens to the rays of light that strike the convex mirror when the object is placed at infinity?
Ans: When the object is placed at infinity, parallel rays of light from the object strike the convex mirror and appear to diverge after reflection. These diverging rays appear to originate from the principal focus (F) of the convex mirror.

(iv) Describe the nature and characteristics of the image formed when the object is placed at infinity in front of a convex mirror.
Ans: When the object is placed at infinity in front of a convex mirror, the image formed is virtual, erect, diminished in size, and located at the principal focus (F) behind the mirror. It is a point-sized image.

(v) How does the size of the image compare to the size of the object when the object is placed at infinity in front of a convex mirror?
Ans: When the object is placed at infinity in front of a convex mirror, the size of the image is smaller than the size of the object. The image is diminished in size, appearing as a point.

Q7: Answer the following questions based on the diagram given below:



(i) What is the purpose of the experiment involving the refraction of light through a rectangular glass slab?
Ans: The purpose of this experiment is to observe and understand how light changes its path when it passes through a rectangular glass slab due to refraction.

(ii) What are the two main observations made in this experiment?
Ans: The two main observations are:

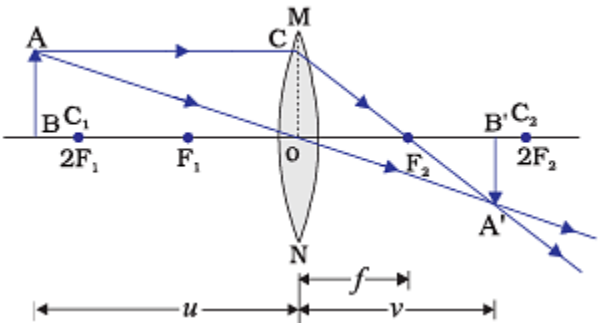
- The incident ray of light deviates or changes its direction when it enters the glass slab.
- The emergent ray of light deviates again when it exits the glass slab and returns to its original direction.

(iii) Why does the incident ray change its direction when it enters the glass slab?
Ans: The incident ray changes its direction due to the difference in the speed of light in air and glass. Light slows down when it enters the glass, causing refraction.

(iv) When does the emergent ray of light deviate once more as it exits the glass slab?
Ans: The emergent ray of light deviates when it exits the glass slab if it is incident at an angle other than perpendicular (i.e., not at 90 degrees) to the slab's surfaces.

(v) What happens to the emergent ray if it is incident perpendicular to the glass slab?
Ans: When the incident ray is perpendicular to the glass slab, the emergent ray continues in the same direction without deviating. There is no lateral shift observed in this case.

Q8: Answer the following questions based on the diagram given below:



(i) What happens to the image when the object is placed beyond $2F_1$ for a convex lens?
Ans: When the object is placed beyond $2F_1$ for a convex lens, a real and inverted image is formed on the opposite side of the lens on the screen.

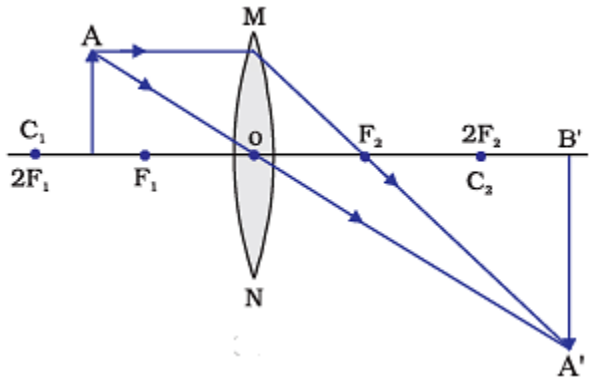
(ii) How does the size of the image compare to the size of the object when the object is placed beyond $2F_1$?
Ans: When the object is placed beyond $2F_1$, the size of the image is smaller than the size of the object

(iii) Where is the image formed in relation to the lens when the object is placed beyond $2F_1$?
Ans: The image is formed on the same side as the object (the side facing the light source), but it is beyond the $2F_1$ point on the opposite side of the lens.

(iv) Is the image real or virtual when the object is placed beyond $2F_1$?
Ans: When the object is placed beyond $2F_1$, the image formed is real. This means it can be projected onto a screen and can be captured.

(v) What happens to the image distance as the object is moved even farther away from the lens beyond $2F_1$?
Ans: As the object is moved even farther away from the lens beyond $2F_1$, the image distance also increases, and the image becomes smaller and more distant from the lens.

Q9: Answer the following questions based on the diagram given below:



(i) What type of lens is used in this experiment, and how is it different from a concave lens?
Ans: In this experiment, a convex lens is used. A convex lens is thicker at the center and thinner at the edges, whereas a concave lens is thinner at the center and thicker at the

edges. This difference in shape causes convex lenses to converge light rays, while concave lenses diverge them.

(ii) Where is the object placed in this experiment, and why is it positioned there?
Ans: The object is placed between $2F_1$ (twice the focal length) and F_1 (the focal length) of the convex lens. This position is chosen because it forms a real and inverted image on the same side as the object. It also allows us to observe various properties of the image formation by a convex lens.

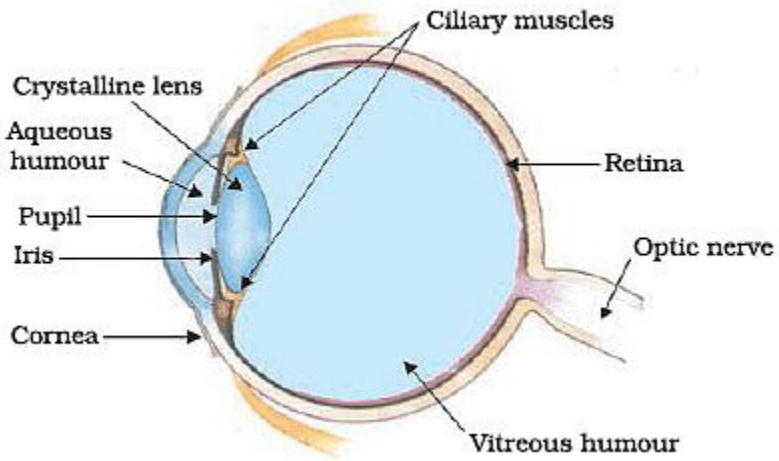
(iii) Describe the nature and characteristics of the image formed in this experiment.
Ans: The image formed is real, inverted, and diminished in size. It is located on the same side as the object, between the focal point (F_1) and twice the focal length ($2F_1$). This means that the image is smaller than the object and appears upside down.

(iv) How does the image change when you move the object closer to the lens from the $2F_1$ position?
Ans: When the object is moved closer to the lens from the $2F_1$ position, the image also moves closer to the lens on the same side as the object. The image size increases, but it remains real, inverted, and on the same side as the object.

(v) What happens to the image if the object is moved beyond $2F_1$ away from the lens?
Ans: If the object is moved beyond $2F_1$ away from the lens, the image will be formed on the opposite side of the lens (the side opposite to the object). It will still be real and inverted, but it will also be larger in size compared to when it was between $2F_1$ and F_1.

The Human Eye and the Colourful World

Q1: Answer the following questions based on the diagram given below:



(i) Identify the parts labeled A, B, and C in the diagram of the human eye.
Ans: A represents the cornea, B is the lens, and C denotes the retina.

(ii) Explain how the cornea and lens work together to focus light on the retina.
Ans: The cornea and lens refract or bend incoming light rays. The cornea does most of the bending, while the lens fine-tunes the focus. Together, they ensure that the light converges on the retina, forming a clear image.

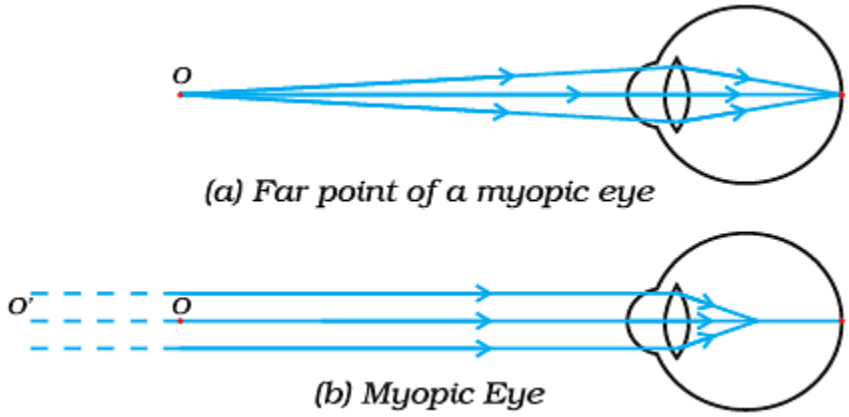
(iii) What is the function of the retina in the human eye?
Ans: The retina contains light-sensitive cells called photoreceptors (rods and cones) that detect light and convert it into electrical signals. These signals are then sent to the brain via the optic nerve, allowing us to perceive images.

(iv) What role does the iris play in the eye's functioning?
Ans: The iris controls the size of the pupil. In bright light, the iris contracts, making the pupil smaller to limit the amount of light entering the eye. In dim light, the iris expands, making the pupil larger to allow more light in for better vision.

(v) Explain the difference between nearsightedness and farsightedness, and how corrective lenses help in each case.
Ans: Nearsightedness (myopia) occurs when the image focuses in front of the retina,

making distant objects appear blurry. Farsightedness (hyperopia) happens when the image focuses behind the retina, making close objects unclear. Corrective lenses for myopia are concave (diverging) to move the image back to the retina, while for hyperopia, they are convex (converging) to bring the image forward to the retina, thus improving vision.

Q2: Answer the following questions based on the diagram given below:



(i) What is myopia, and how does it affect the vision of a person?
Ans: Myopia, commonly known as nearsightedness, is an eye condition where a person can see nearby objects clearly but has difficulty seeing distant objects. This happens because the image formed by the lens in a myopic eye falls in front of the retina instead of directly on it.

(ii) Explain the role of the eyeball's shape in causing myopia.
Ans: Myopia is often caused by an elongated eyeball. In myopic individuals, the eyeball is longer from front to back, which causes light rays to converge in front of the retina, making distant objects appear blurry.

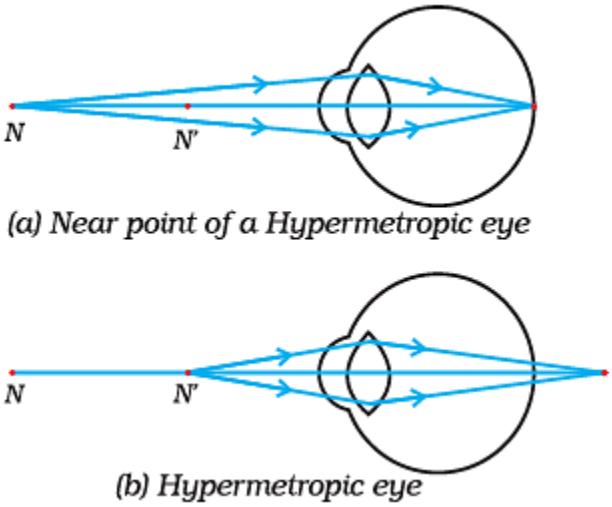
(iii) Describe how a concave lens can help correct myopia.
Ans: A concave lens is used to correct myopia because it diverges incoming light rays before they enter the eye. This allows the light to focus properly on the retina, enabling a myopic person to see distant objects clearly.

(iv) What are the common symptoms of myopia, and how can one identify if they have this condition?
Ans: Common symptoms of myopia include squinting to see distant objects clearly,

frequent headaches, and difficulty reading the chalkboard or watching TV from a distance. An eye check-up by an optometrist can confirm if someone has myopia.

(v) Explain the difference between myopia and hyperopia (farsightedness).
Ans: Myopia and hyperopia are both refractive eye conditions, but they affect vision differently. Myopia, or nearsightedness, allows clear vision for nearby objects but causes blurriness for distant ones. In contrast, hyperopia, or farsightedness, causes difficulty in seeing nearby objects clearly but clear vision for distant objects because the light focuses behind the retina.

Q3: Answer the following questions based on the diagram given below:



(a) Near point of a Hypermetropic eye

(b) Hypermetropic eye

(i) What is a hypermetropic eye?
Ans: A hypermetropic eye is an eye that has difficulty focusing on nearby objects due to the light rays entering the eye converging behind the retina instead of directly on it. This condition is also known as farsightedness.

(ii) Explain why a hypermetropic eye has difficulty seeing nearby objects.
Ans: A hypermetropic eye has a shorter-than-normal eyeball, which causes light rays to focus behind the retina instead of on it. This means that when a person with hypermetropia tries to see something up close, the image is formed behind the retina, making it appear blurry.

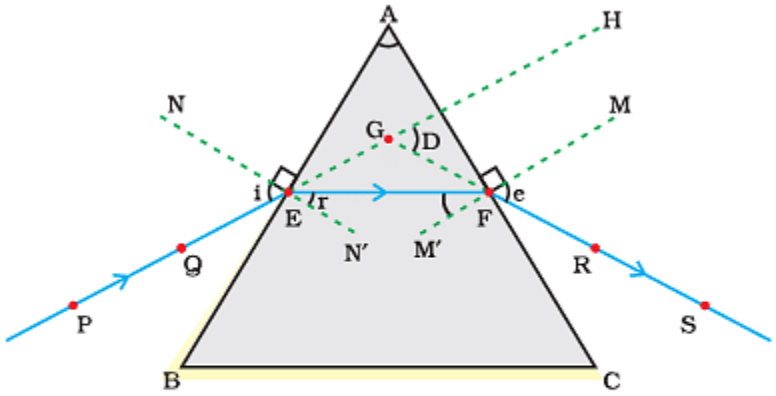
(iii) How can someone with a hypermetropic eye correct their vision?
Ans: Hypermetropia can be corrected using converging lenses, also known as convex

lenses. These lenses help to converge the incoming light rays so that they focus properly on the retina, allowing the person to see nearby objects clearly.

(iv) What is the difference between a hypermetropic eye and a normal eye?
Ans: The main difference between a hypermetropic eye and a normal eye is the shape of the eyeball. In a normal eye, the eyeball is typically longer, allowing light rays to focus directly on the retina. In a hypermetropic eye, the eyeball is shorter, causing light rays to focus behind the retina.

(v) Can hypermetropia develop at any age, or is it present from birth?
Ans: Hypermetropia can be present from birth (congenital hypermetropia), but it can also develop later in life. Some individuals may not notice their hypermetropic condition until they reach their 40s or 50s when the natural aging process of the eye, known as presbyopia, causes difficulties with near vision.

Q4: Answer the following questions based on the diagram given below:



PE – Incident ray
EF – Refracted ray
FS – Emergent ray
∠A – Angle of the prism
∠i – Angle of incidence
∠r – Angle of refraction
∠e – Angle of emergence
∠D – Angle of deviation

(i) What is the purpose of conducting the experiment with a triangular glass prism?
Ans: The purpose of this experiment is to observe and understand how light behaves when it passes through a triangular glass prism, including how it bends or refracts.

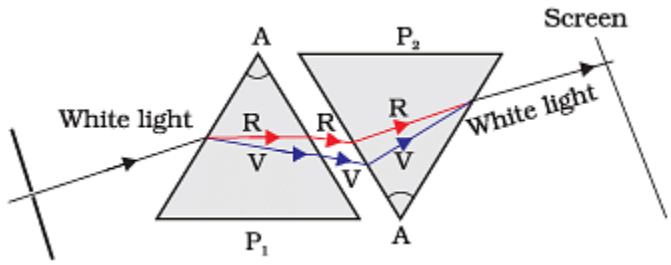
(ii) What happens to a ray of light when it enters the prism from air at an angle?
Ans: When a ray of light enters the prism from air at an angle, it undergoes refraction, meaning it changes direction and bends towards the base of the prism.

(iii) Why does the ray of light bend when it enters the prism?
Ans: The ray of light bends because it slows down as it enters the denser medium of the glass prism. This change in speed causes the light to change its direction or refract.

(iv) Describe what happens when the refracted ray exits the other side of the prism.
Ans: When the refracted ray exits the other side of the prism and enters the air again, it bends away from the base of the prism and continues its path. This bending is known as refraction once more.

(v) What is the main conclusion we can draw from this experiment about the behavior of light in a triangular glass prism?
Ans: The main conclusion from this experiment is that light undergoes two refractions as it passes through a triangular glass prism. It bends towards the base when entering the prism and away from the base when exiting, demonstrating the phenomenon of refraction.

Q5: Answer the following questions based on the diagram given below:



(i) What is the purpose of the experiment involving the recombination of the spectrum of white light?
Ans: The purpose of the experiment is to show how white light can be split into its constituent colors (spectrum) and then recombined to form white light again.

(ii) What is the name of the device used to split white light into its constituent colors?
Ans: The device used is called a prism.

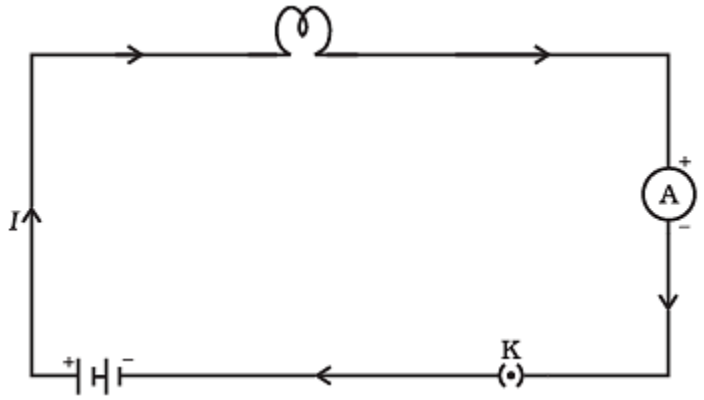
(iii) What happens to white light when it passes through a prism?
Ans: When white light passes through a prism, it is refracted and separated into a spectrum of colors due to the different wavelengths of light bending by different amounts.

(iv) How can the spectrum of colors be recombined to form white light again?
Ans: The spectrum of colors can be recombined by passing each color through another identical prism in the reverse order. When the colors exit the second prism, they overlap and combine to form white light.

(v) What is the significance of this experiment in understanding the nature of light?
Ans: This experiment helps us understand that white light is composed of various colors with different wavelengths. It demonstrates the phenomenon of dispersion and the ability to recombine colors to recreate white light. This experiment laid the foundation for our understanding of the nature of light and the electromagnetic spectrum.

Electricity

Q1: Answer the following questions based on the diagram given below:



(i) What is the purpose of including a cell in this electric circuit?
Ans: The cell provides the source of electrical energy to the circuit, allowing current to flow and the bulb to light up.

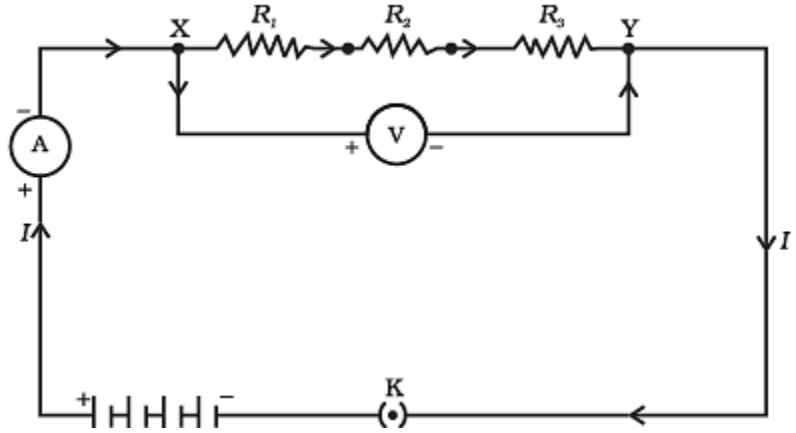
(ii) Explain the function of the electric bulb in this circuit.
Ans: The electric bulb is a component that emits light when electricity passes through it. In this circuit, it lights up when the circuit is complete.

(iii) Why is an ammeter included in this circuit, and what does it measure?
Ans: The ammeter is included to measure the electric current flowing through the circuit. It measures the amount of current in amperes (A).

(iv) What role does the plug key play in this experiment?
Ans: The plug key is a switch that can open or close the circuit. When it is closed (turned on), the circuit is complete, and current flows. When it is open (turned off), the circuit is broken, and current stops.

(v) What will happen to the electric bulb if the plug key is opened (turned off)?
Ans: When the plug key is opened (turned off), the circuit is broken, and the electric bulb will not light up. It will remain off as long as the key is open.

Q2: Answer the following questions based on the diagram given below:



(i) What does the diagram show regarding the arrangement of resistors?
Ans: The diagram shows that the resistors are connected end-to-end in a single path, one after the other, forming a series circuit.

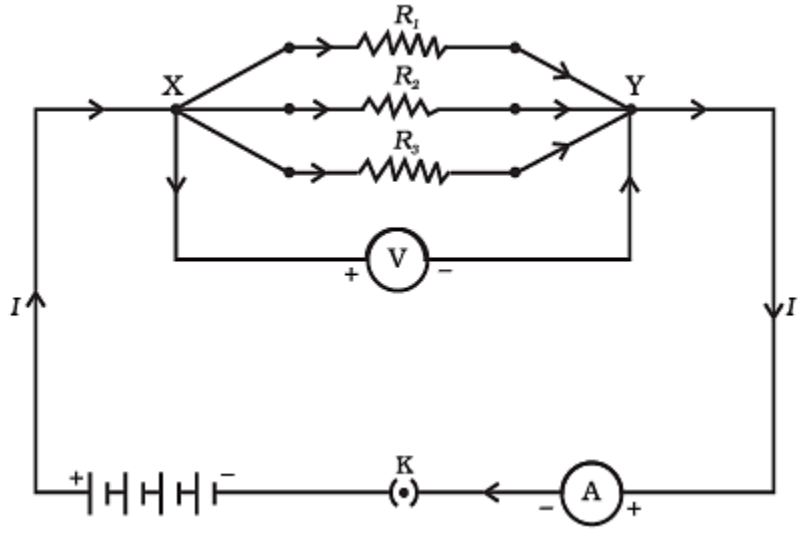
(ii) How does the total resistance in a series circuit compare to the individual resistances of the resistors?
Ans: In a series circuit, the total resistance is equal to the sum of the individual resistances of all the resistors connected in series.

(iii) If two resistors, one with resistance 3 ohms and another with resistance 4 ohms, are connected in series, what is the total resistance of the circuit?
Ans: The total resistance of the circuit will be 3 ohms + 4 ohms = 7 ohms.

(iv) What happens to the current flowing through each resistor in a series circuit when additional resistors are added to the circuit?
Ans: In a series circuit, adding more resistors increases the total resistance of the circuit, which in turn reduces the overall current flowing through the entire circuit, including each resistor.

(v) If a 12-volt battery is connected to a series circuit with three resistors, each with a resistance of 6 ohms, what will be the total current flowing through the circuit?
Ans: To find the total current, we can use Ohm's Law: I (current) = V (voltage) / R (total resistance). In this case, I = 12 volts / (6 ohms + 6 ohms + 6 ohms) = 12 volts / 18 ohms = 2/3 amperes (or 0.67 amperes). So, the total current flowing through the circuit will be approximately 0.67 amperes.

Q3: Answer the following questions based on the diagram given below:



(i) What is meant by resistors in parallel?

Ans: Resistors in parallel are a configuration where two or more resistors are connected to the same two points in a circuit. In this setup, the current has multiple pathways to flow, and each resistor offers its own path for the current.

(ii) How does the total resistance of resistors in parallel compare to the individual resistances?

Ans: The total resistance of resistors in parallel is less than the smallest individual resistance. In other words, it is smaller than any single resistor in the parallel arrangement.

(iii) What happens to the total current when resistors are connected in parallel?

Ans: When resistors are connected in parallel, the total current flowing through the circuit increases compared to a single resistor. This is because the total resistance decreases, allowing more current to flow.

(iv) Can you explain why appliances in our homes are connected in parallel rather than in series?

Ans: Appliances in our homes are connected in parallel because if they were connected in series, the total resistance would be too high, and the current would be insufficient to power all the appliances simultaneously. Parallel connections ensure that each appliance gets the required voltage and can operate independently.

(v) How can you calculate the total resistance of resistors in parallel?

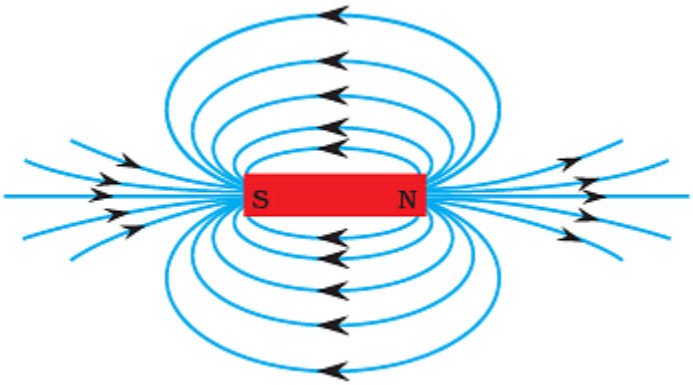
Ans: To calculate the total resistance (R_{total}) of resistors in parallel, you can use the formula:

$$\frac{1}{R_total} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots$$

Where R_1, R_2, R_3, etc., are the individual resistances. Simply find the reciprocals of each resistor's resistance, add them up, and then take the reciprocal of the sum to get R_{total}.

Magnetic Effects of Electric Current

Q1: Answer the following questions based on the diagram given below:



(i) What is the shape of the magnetic field lines around a bar magnet, as shown in the experiment?
Ans: The magnetic field lines around a bar magnet form closed loops, extending from the north pole to the south pole.

(ii) How can you determine the direction of the magnetic field lines using the experiment?
Ans: You can determine the direction of magnetic field lines using a small compass needle. The direction in which the compass needle points at any location around the magnet shows the direction of the magnetic field line at that point.

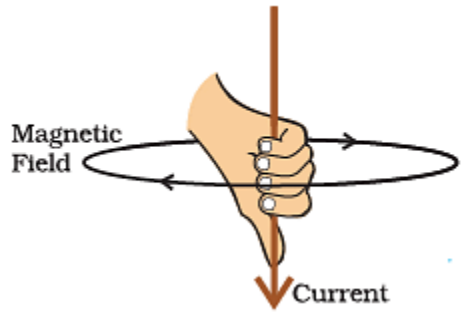
(iii) What do the field lines inside the magnet look like, based on the diagram?
Ans: Inside the magnet, the magnetic field lines run from the south pole to the north pole in a curved path.

(iv) How does the spacing of magnetic field lines indicate the strength of the magnetic field?
Ans: The closer the magnetic field lines are to each other, the stronger the magnetic field is at that point. The spacing of field lines is a visual representation of the field's strength.

(v) Why do magnetic field lines never cross each other?
Ans: Magnetic field lines never cross each other because if they did, it would imply that a single point in space has two different directions of magnetic field, which is not possible.

The absence of crossings ensures that each point has a unique direction for the magnetic field.

Q2: Answer the following questions based on the diagram given below:



(i) What is the Right-hand thumb rule used for in the context of electricity and magnetism?
Ans: The Right-hand thumb rule is used to determine the direction of the magnetic field around a current-carrying conductor.

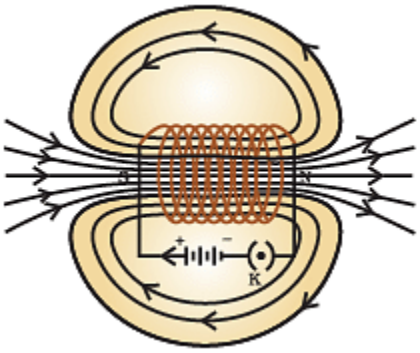
(ii) Describe the setup of an experiment where the Right-hand thumb rule can be applied.
Ans: To demonstrate the Right-hand thumb rule, you can set up an experiment with a straight current-carrying wire. Place your right thumb in the direction of the current flow (from positive to negative), and your fingers will curl in the direction of the magnetic field lines around the wire.

(iii) If the current in a wire flows from north to south and you use the Right-hand thumb rule, what direction will the magnetic field lines wrap around the wire?
Ans: Using the Right-hand thumb rule, the magnetic field lines will wrap around the wire in a clockwise direction when viewed from the top.

(iv) How does the strength of the magnetic field change with the increase in current in the wire when applying the Right-hand thumb rule?
Ans: When the current in the wire increases, the strength of the magnetic field, as indicated by the curvature of the magnetic field lines when using the Right-hand thumb rule, also increases. They become more tightly wound around the wire.

(v) Can you explain a real-life application of the Right-hand thumb rule?
Ans: Sure! One practical application of the Right-hand thumb rule is in designing electromagnets. Engineers use this rule to determine the direction of the magnetic field within the coil of an electromagnet, ensuring it aligns with the intended purpose, such as picking up metal objects in a junkyard or controlling the movement of particles in a particle accelerator.

Q3: Answer the following questions based on the diagram given below:



(i) What is a solenoid in the context of electricity and magnetism?
Ans: A solenoid is a long, tightly wound coil of wire. It is used to generate a magnetic field when an electric current passes through it.

(ii) How does the magnetic field inside a solenoid compare to the magnetic field outside it?
Ans: Inside a solenoid, the magnetic field is strong and uniform, running parallel to the coil's axis. Outside the solenoid, the magnetic field is weak and resembles the field lines of a bar magnet, forming closed loops.

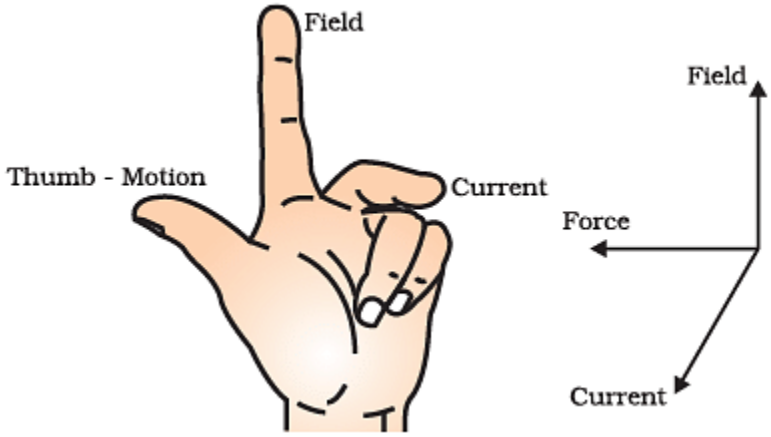
(iii) Explain why the magnetic field lines around a solenoid are concentrated inside the coil.
Ans: The magnetic field lines are concentrated inside the solenoid because the turns of wire are closely packed together. This arrangement amplifies the magnetic field strength within the coil while minimizing it outside.

(iv) If the current flowing through a solenoid is increased, what happens to the strength of the magnetic field inside it?
Ans: When the current through a solenoid is increased, the strength of the magnetic

field inside it also increases. This is because the magnetic field strength is directly proportional to the current passing through the solenoid.

(v) How does the direction of the magnetic field inside a solenoid relate to the direction of the current flowing through it?
Ans: The direction of the magnetic field inside a solenoid is along the axis of the coil, and it follows the right-hand thumb rule. If you point your right thumb in the direction of the current flow, your fingers will curl in the direction of the magnetic field lines inside the solenoid.

Q4: Answer the following questions based on the diagram given below:



(i) What is Fleming's left-hand rule used for?
Ans: Fleming's left-hand rule is used to determine the direction of the magnetic force experienced by a current-carrying conductor in a magnetic field.

(ii) Explain the three main factors involved in Fleming's left-hand rule.
Ans: The three main factors are:

- The thumb points in the direction of the motion (the current).
- The forefinger points in the direction of the magnetic field.
- The middle finger points in the direction of the magnetic force experienced by the conductor.

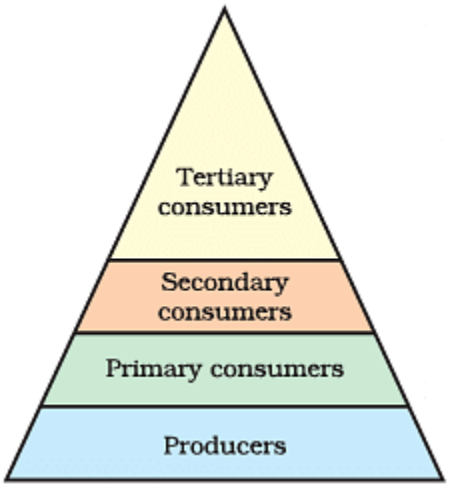
(iii) In Fleming's left-hand rule, what does the thumb represent?
Ans: In Fleming's left-hand rule, the thumb represents the direction of the current (motion) in the conductor.

(iv) What does the forefinger indicate in Fleming's left-hand rule?
Ans: The forefinger in Fleming's left-hand rule indicates the direction of the magnetic field lines in which the conductor is placed.

(v) How can you determine the direction of the magnetic force using Fleming's left-hand rule?
Ans: To determine the direction of the magnetic force on a current-carrying conductor, align your left hand so that your thumb represents the direction of current, your forefinger indicates the direction of the magnetic field, and your middle finger will point in the direction of the magnetic force experienced by the conductor.

Our Environment

Q1: Answer the following questions based on the diagram given below:



(i) In the trophic levels diagram, what are the primary producers, and what is their main source of energy?
Ans: The primary producers are typically plants or algae, and their main source of energy is sunlight, which they use for photosynthesis.

(ii) What is the role of herbivores in the trophic levels? Give an example of a herbivore.
Ans: Herbivores are consumers that feed on primary producers (plants or algae). An example of a herbivore is a rabbit, which eats plants.

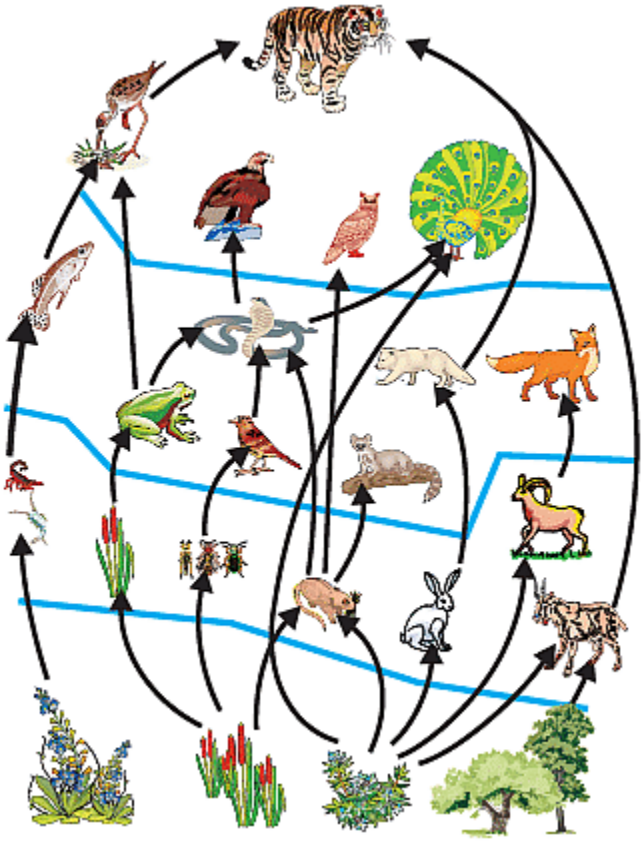
(iii) Explain the concept of a food chain using the trophic levels diagram. Provide an example of a food chain.
Ans: A food chain is a sequence of organisms in which each one is eaten by the next member in the chain. For example, in a grassland ecosystem, a food chain might be: Grass (producer) -> Grasshopper (herbivore) -> Snake (carnivore) -> Hawk (top carnivore).

(iv) What do we call an organism that feeds on both plants and animals in the trophic levels diagram?
Ans: An organism that feeds on both plants and animals in the trophic levels diagram is

called an omnivore. Humans are examples of omnivores because we eat both plants and animals.

(v) How does energy flow in the trophic levels diagram? Explain why the number of top carnivores is usually much smaller than the number of primary producers.
Ans: Energy flows from one trophic level to another in the form of food. However, not all energy is transferred; some is lost as heat at each level. This limits the amount of energy available to higher trophic levels. As a result, the number of top carnivores is much smaller because there is less energy available to support a large population of top predators compared to primary producers. This is known as the 10% rule, where only about 10% of the energy is passed on to the next trophic level.

Q2: Answer the following questions based on the diagram given below:



(i) What is a food web, and how does it differ from a food chain?
Ans: A food web is a network of interconnected food chains in an ecosystem, showing how different organisms are linked by their feeding relationships. In contrast, a food chain represents a linear sequence of organisms, where one organism eats another.

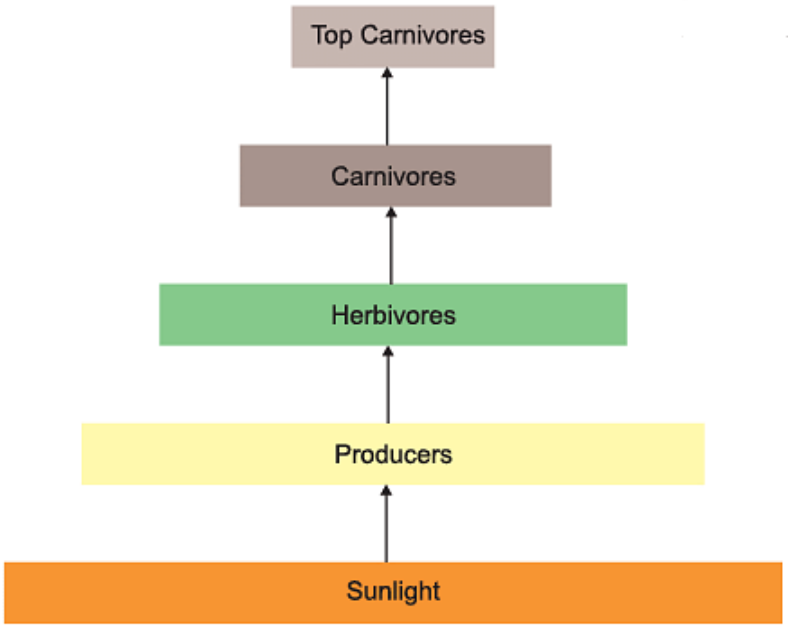
(ii) Why are decomposers important in a food web?
Ans: Decomposers are essential in a food web because they break down dead organisms and organic matter, returning nutrients to the soil. This recycling of nutrients ensures that the ecosystem remains healthy and sustainable.

(iii) Explain the role of producers in a food web. Give an example of a producer.
Ans: Producers are organisms that make their own food through photosynthesis, using sunlight to convert carbon dioxide and water into glucose. An example of a producer is a green plant.

(iv) What happens when a predator in a food web becomes extinct?
Ans: When a predator in a food web becomes extinct, it can have a cascading effect on the entire ecosystem. The population of its prey may increase, leading to overgrazing or overpopulation, which can disrupt the balance in the ecosystem.

(v) How does the energy flow in a food web?
Ans: Energy flows through a food web in a unidirectional manner, starting with the producers (plants) that capture sunlight energy. Herbivores eat the producers, and then carnivores eat the herbivores. As each organism consumes the one below it, some energy is lost as heat at each level, making the energy pyramid narrower as it goes up the food chain.

Q3: Answer the following questions based on the diagram given below:



(i) In the energy flow diagram of an ecosystem, what is usually represented at the bottom of the diagram, and why is it placed there?
Ans: The producers, such as plants, are typically shown at the bottom of the energy flow diagram because they are the primary source of energy in an ecosystem. They capture energy from the sun through photosynthesis and serve as the foundation of the food chain.

(ii) How is energy transferred from one trophic level to another in an ecosystem, as shown in the diagram?
Ans: Energy is transferred from one trophic level to another through the consumption of organisms. Herbivores eat plants, and carnivores eat herbivores. This transfer of energy occurs as organisms are eaten and digested, with some energy being passed along to the next trophic level.

(iii) Explain the role of decomposers in the energy flow within an ecosystem based on the diagram.
Ans: Decomposers, such as bacteria and fungi, play a crucial role in recycling nutrients and energy in an ecosystem. They break down dead organisms and organic matter, releasing nutrients back into the environment. This process allows energy to be returned to the ecosystem, completing the energy flow cycle.

(iv) What happens to the amount of energy as it moves up the trophic levels in the ecosystem, as depicted in the diagram?
Ans: As energy moves up the trophic levels in an ecosystem, it decreases. This is because some energy is lost as heat during metabolic processes, and only a portion of the energy from one trophic level is transferred to the next. As a result, there is less energy available to higher trophic levels.

(v) How does the concept of a food chain relate to the energy flow in an ecosystem, as illustrated in the diagram?
Ans: A food chain is a simplified representation of the energy flow within an ecosystem. It shows the sequence of organisms where each one is consumed by the next in line. The energy flows from producers to primary consumers (herbivores), then to secondary consumers (carnivores), and so on. The diagram represents these relationships and the transfer of energy from one organism to another in a linear fashion.

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